FLIGHT

The AIRCRAFT ENGINEER & AIRSHIPS

First Aeronautical Weekly in the World. Founded January, 1909

Founder and Editor : STANLEY SPOONER

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport

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DIARY OF CURRENT AND FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in this list—

1929

Jan. 11.... Conference of the F.A.I., Paris
May 21.... Northampton Air Pageant
June .... Rotterdam International Air Meeting
July 13.... R.A.F. Display at Hendon
July 16–27 7th International Aero Exhibition, Olympia
Oct. 31.... Guggenheim Safe-Aircraft Competition Closes

EDITORIAL COMMENT

Twenty Years of "FLIGHT"

UNBELIEVABLE as it appears to us, with this issue of FLIGHT we complete 20 years' publication. The first number of FLIGHT as a separate journal made its appearance on January 2, 1909. Flying had been dealt with in a special aviation section of our sister journal, THE AUTO., for a number of years previously, but FLIGHT as a self-contained entity came into being 20 years ago. Whether or not it would be self-supporting was a very great problem in 1909, and there were many who refused to share the faith in aviation which the Founder-Editor exhibited by starting FLIGHT. For a number of years we had a lean time of it. The aircraft industry was diminutive, if, indeed, it could be called an industry at all, and its members were possessed of far more enthusiasm than cash. However, we all worked together for the common good. Those early experimenters who could do so supported us with an occasional advertisement. Those who could not, gave us at any rate their moral support, which, if it did not pay our printers' bills, at least encouraged us to carry on with the good work. And in the end our faith in the future of flying has been justified. The British Aircraft Industry is, if not overwhelmed with wealth, at least firmly established, and even the most sceptical will hardly deny that aviation has before it a future of such magnitude that it cannot be assessed at the present time.

Page 1 of No. 1, Vol. I, of FLIGHT was in the form of a large photograph showing a Voisin biplane, complete with "side curtains," flying at a height of some 20 ft., and the inscription under the photograph read : "A SECOND ENGLISHMAN FLIES : Mr. J. T. C. Moore-Brabazon, who is so well known in connection with ballooning, and who is a member of the Committee of the Aero Club of Great Britain and Ireland, is the second Englishman to fly with his own machine, sharing with Mr. Henry Farman that distinction. On December 3, at Issy, he made three consecutive flights of 500 to 600 metres each, our photograph above being secured during one of these.

The motor he employed is an ordinary 50 h.p. Vivinus; the aeroplane, upon the lines of the Voisin-Farman biplane, was also constructed by MM. Voisin Freres." It is, perhaps, significant that the first photograph of an aeroplane to appear in FLIGHT should have been a flying view; ever since, and during the last few years particularly, photographs of aircraft "grass-cutting" have been a familiar and appreciated feature of our pages.

In the "Leader" of our first number we outlined the policy which was to be FLIGHT's, and made the statement: "Primarily, of course, everyone's attention is chiefly concentrated nowadays on the motor-driven aeroplane, or on other types of machine which similarly need no gasbag; but, for all that, it would be absurd for FLIGHT to neglect the airship, the kite, or our old friend the spherical balloon. *Anything* which tends towards progress in aerial navigation, whether by direct achievement or by the indirect method of lessons learnt, essentially comes within our immediate purview." That policy we have always aimed to maintain, and we will leave it to our readers to judge whether or not we have been successful.

To the British Aircraft Industry, which from the first has given us such support as it could afford, we extend our sincere thanks for 20 years of co-operation. Many of the firms now in existence did their share towards making the publication of FLIGHT possible in the early days; and we are happy to count them still among our oldest and best friends.

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Sir Hugh Trenchard

When it was announced that Air Marshal Sir John Salmond would join the Air Council in January, 1929, the inference was immediately drawn that the retirement of Marshal of the Royal Air Force Sir Hugh Trenchard from his position of Chief of the Air Staff could not be much longer deferred. It is now announced that that event, so often prophesied, will actually take place a year hence. Such an event will mark the end of an epoch, for it is Sir Hugh Trenchard who has laid the foundation stone of the first air force in the history of the world, and has been building on that stone for the last nine years. War is the best school for a fighting force, but it is not the best cradle. The Royal Air Force was born in war time, but in a sense it was still-born. At the end of 1918 Great Britain had a huge machine for fighting in the air, but it was not a fighting service in the British conception of the term. In 1919 that machine practically disappeared, and Sir Hugh Trenchard was entrusted with the task of making a fresh start and building up almost from the beginning. It was a huge task, though perhaps not quite so tremendous as at first sight it may have seemed. It was inevitable that the experience and the traditions of the Navy and the Army should be drawn upon, and it was fortunate that this mass of experience was available. It was also inevitable that Army methods should count for more than Navy methods in the new service. All this being so, the work might have been counted moderately straightforward to a man who had behind him a public school, Woolwich or Sandhurst, Camberley or Quetta. The extraordinary thing is that Sir Hugh Trenchard has none of these qualifications. He was educated privately, he entered the army through the militia, and he spent all his army career, not holding high staff appointments, but as an ordinary regimental officer. For 13 years he was almost constantly fighting in South Africa and in Nigeria. In 1912 he learnt to fly and joined the R.F.C. (Military Wing). Two years later he was again engaged in warfare, and France occupied all his attention for the next four years. In all military operations he proved himself an able and inspiring leader, and during the four years in France he displayed organising abilities of a very high order. Yet on the face of it, this fighting career hardly marked him out as the one man fitted to take in hand the formation of a new fighting service. Many a general has won the affection of his fighting men in the field, but has failed when seated at the desk of the administrator. Sir Hugh Trenchard did not fail.

It was, in fact, in 1919, when his 17 years of warfare were behind him, that Sir Hugh Trenchard commenced what was to prove the greatest work of his life. It was probably the best thing which could have happened that the enormous, ill-disciplined air force, equipped with machines most of which were already obsolescent, melted away in a few months under the double impetus of the charms of civil life and the national demands for economy. The Chief of the Air Staff was able to keep but a few of the officers and men, and so he was free to pick only the very best. "Best" did not mean merely the most courageous or the most skilful pilots; it meant best material on which to build up a totally new force. The force had no traditions, except those of fighting. It had little or no standards of peace-time conduct. Its uniform was in a state of flux; new titles of rank had to be invented. The Chief of the Air Staff was at that time free to decide whether officers should be permanently posted to one unit, as in the army, or should be in one pool and only temporarily posted to units, as in the navy. He was free to decide whether a pilot should normally be an officer or an airman. He had to provide for the future supply of both commissioned and other ranks. He had to institute an intellectual study of that novel conception, Air Defence. He had to deal with many problems of equipment, of aerodromes, and of quarters. The need for economy may have helped him no little in the earlier days, but it must have tried him severely as his schemes began to develop. He had to deal with a series of Secretaries of State and Undersecretaries, some apathetic, some incompetent, and some (finally) both able and zealous.

We have said that on paper Sir Hugh Trenchard had few qualifications for such a task. It should be added that at the beginning his co-adjutors were all very youthful men for the positions which they were called on to hold, and nearly all of them had more experience in the air or on the field than at the desk. Yet the work has been done, and it has, beyond question, been well done. The Royal Air Force is still small, but it is growing. Its flying efficiency is admittedly the best of any air service in the world.

Both Cranwell and Halton turn out each year a class of officer and airman of just the right type for the service. At Andover the problems of Air Defence are studied, and staff officers are trained. Some points of Sir Hugh Trenchard's policy may be criticised, and some may in course of time be found wrong—the same can be said of any administrator. Looked at broadly, the work of Sir Hugh Trenchard has been good, and he has gloriously stultified by his later career the decisions of the Sandhurst examiners thirty years ago.

THE ELIAS "AIRCOUPE"

An American Medium-Powered Commercial Monoplane

IN designing the Elias "Aircoupe," Joseph L. Cato—who, by the way, produced a very interesting little sporting parasol monoplane as far back as 1919 (see FLIGHT, October 9, 1919)—not only did so in accordance with the U.S. Department of Commerce regulations as they stand today, but looked a little ahead and embodied features with a view to meeting requirements of the future.

The "Aircoupe," which is constructed by G. Elias & Bro., Inc. of Buffalo, N.Y., is not classed by its producers as a light 'plane in the sense in which this class of machine has been known in America until recently. It is intended to be a commercial machine of medium size and power but with a high performance. It is, however, in every way suitable for light 'plane work, such as clubs, flying schools, and the private owner, as well as for business or sporting purposes.

It is a braced high-wing, or "parasol," monoplane, and is produced in two models—one with an open cockpit, and the other with an enclosed "coupe"; it is, however, readily convertible from one type to the other. Safety has been the first consideration in the design of this machine. It has an exceptionally flat gliding angle, low landing speed, and instantaneous response to the controls at all speeds. High factors of safety have, it is claimed, been maintained at all points, while the landing gear is both wide and strong. Another feature is that every important fitting is in sight and easily inspected.

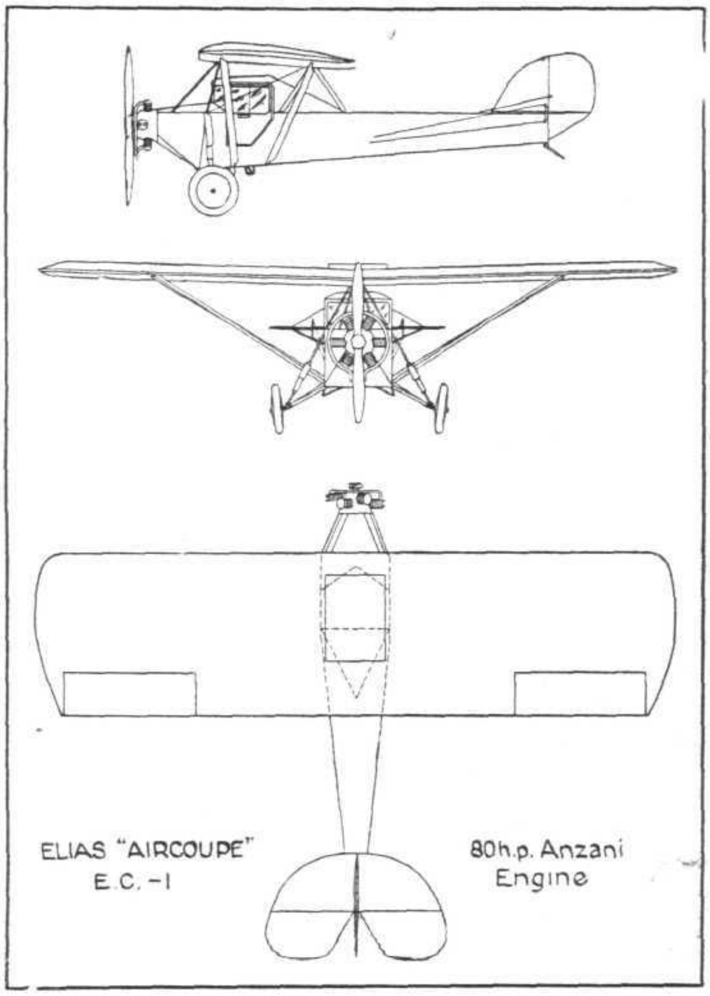
Attention has also been given to the comfort of pilot and passenger, who sit side by side in well-upholstered seats in a roomy, well-ventilated cabin with plenty of leg room. Unobstructed vision—except perhaps immediately overhead—is obtained through laminated safety glass windows in front and large sliding windows in the doors each side.

The fuselage being low, entrance and exit can be made with ease through these doors on each side—with as much ease and comfort, in fact, as with a motor-car. At the rear of the cabin, on top of the fuselage, is a compartment for small parcels, and this can be loaded or emptied quite easily from outside, through the cabin door.

As regards performance, the "Aircoupe," equipped with an 80 h.p. Anzani, has a maximum speed of about 90 m.p.h., and a landing speed of about 30 m.p.h. Its climb is 3,600 ft. in 10 mins., while the service ceiling is 10,000 ft. The take-off, in dead calm, is within 125 ft., and on landing the run before coming to rest is about 100 ft.

The main constructional features are as follows. The fuselage is of welded chrome-molybdenum steel tube construction, without bracing wires. The engine mount is of similar construction, so designed that all parts of the power plant are easily accessible; the engine can be dismounted by removing six bolts. Immediately behind the engine is a fire wall. High-grade fabric is employed for the covering of the fuselage.

The wings are of the "semi-cantilever" type, having two lift struts, each side extending from the bottom of the fuselage up to the wings. These struts, it should be noted, do not attach to fittings welded to the fuselage, but are directly attached to tie rods running through the fuselage inside a heavy-gauge steel tube, which also serves as a compression member.



THE ELIAS E.C.-1 "AIRCOUPE": General arrangement drawings

THE ELIAS E.C.-1 "AIRCOUPE": An American medium-size commercial monoplane, fitted with an 80-h.p. Anzani engine.

This method of attaching the lift struts eliminates any danger of fitting failure at the fuselage through crystallising due to vibration. The upper ends of the struts are also fitted with universal fittings, cut from solid nickel steel forgings, heat-treated to 125,000 T.S., bearing on aluminium pads on the underside of the spars. This allows the inverted load to be taken on the under side of the spar, rather than on the bolts that hold in place the side plates carrying the lift loads. The side plates are made from chrome-molybdenum steel, heat-treated to 150,000 T.S.

The wings are constructed of wood with non-routed spruce spars, and the rib webbing is of plywood with spruce cap strips; the entering and trailing edges are of duralumin. The roots of the wing spars are connected together over the fuselage with two $\frac{5}{8}$ in. heat-treated nickel steel " T " bolts, sufficiently large to provide proper bearing surface for the cabane struts. The latter comprise two pyramids of four struts each mounted on the top longerons of the fuselage. The internal drag or drift wires are 10-32 tie rods for the two inner bays and 6-40 for the outer bay or wing tip section.

The horizontal stabiliser is non-adjustable—no adjustment is required as the entire useful load is carried near the c.g., and light or heavy loads do not interfere with the balance of the machine. The vertical fin, however, can be adjusted on the ground, to take up any engine torque. All control surface frames are of welded steel tubing, covered with fabric. Stick and rudder pedal control is employed, all pulleys being of bakelite composition and visible for inspection. The entire control system operates very lightly, and is so designed that all slack can always readily be taken up.

The landing gear is of the non-axle type, with wide track (7 ft. 6 in.). The shock absorber is of special design, and is particularly durable and strong, there being no rubber to decay, air pressure to maintain, and no glands that need attention. The load is taken by a steel coil spring, and bouncing is prevented by hydraulic cylinders. The tail skid swivels in the rudder post through 180°, and is steerable if desired. All working parts are located outside the fuselage, and can easily be inspected.

The fuel tank is located above the wings over the fuselage, giving full gravity feed to the carburettor, even at extreme angles of flight. Sufficient fuel is carried for four hours at cruising speed. Flexible tubing connections are used for joints, and large size copper tubing, properly annealed after forming, is employed.

The main characteristics of the " Aircoupe " are :—

Span	28 ft. $1\frac{1}{2}$ in.
Chord	7 ft. 0 in.
Length overall	20 ft. 11 in.
Height overall	7 ft. 2 in.
Wing area	192 sq. ft.
Area of ailerons..	20·4 sq. ft.
Area of tail plane	13·2 sq. ft.
Area of elevators	13 sq. ft.
Area of fin	3·6 ft.
Area of rudder	6·5 sq. ft.
Weight empty	870 lbs.
Weight loaded	1,334 lbs.
Weight per sq. ft.	7 lbs.
Weight per horse-power ..	16·6 lbs.
Speed range	30-90 m.p.h.
Climb at sea level	590 ft./min.
Ceiling	10,000 ft.
Fuel consumption (80 m.p.h.)..	5 gals./hour.
Oil consumption	·4 gal./hour.

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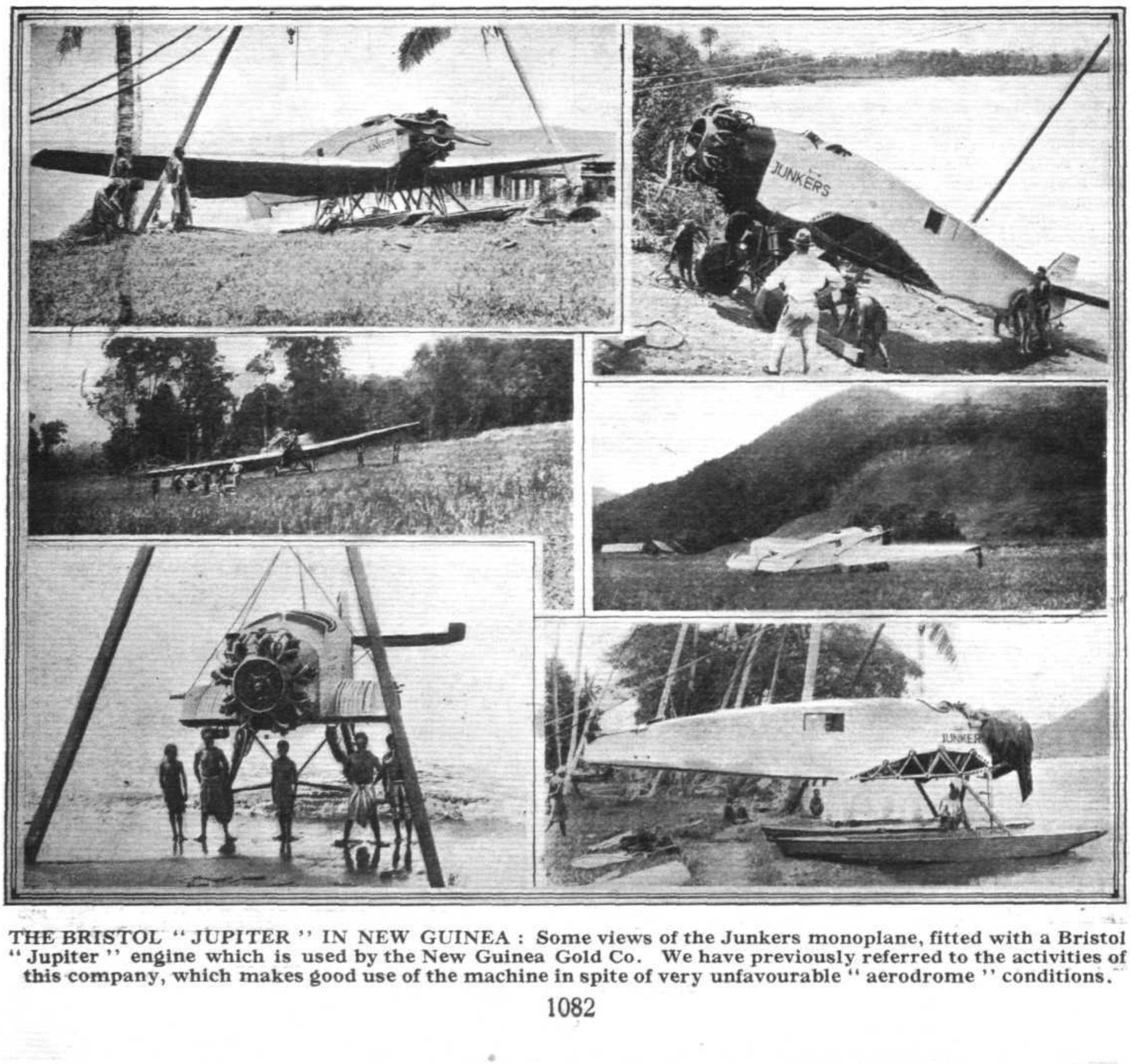


THE BRISTOL " JUPITER " IN NEW GUINEA : Some views of the Junkers monoplane, fitted with a Bristol " Jupiter " engine which is used by the New Guinea Gold Co. We have previously referred to the activities of this company, which makes good use of the machine in spite of very unfavourable " aerodrome " conditions.

ARMSTRONG-WHITWORTH METAL CONSTRUCTION

Placing Aircraft on Engineering Production Basis

BY now it is probably known to most readers of FLIGHT that Sir W. G. Armstrong-Whitworth Aircraft, Ltd., form with Armstrong-Siddeley Motors, Ltd., part of an organisation known as the Armstrong-Siddeley Development Co., Ltd., which also gathered in some little time ago the well-known aircraft firm A. V. Roe and Co., Ltd. The leadership of this great organisation is in the capable hands of Mr J. D. Siddeley, C.B.E., whose interest in and connection with mechanical transport goes right back to the earliest days of motoring. Mr. Siddeley's active connection with aviation began some fourteen years ago, during the early part of the war, 1914-18, when he undertook to construct aircraft and aero engines at the large Siddeley works at Coventry, which had up till then been engaged on the production of motor cars. The first contracts were for aircraft and engines of Government design, *i.e.*, designed at the Royal Aircraft factory (as it then was) at Farnborough. How great became the output of the Coventry factory may be gathered from the fact that during the last month before the armistice no less than 600 Siddeley "Puma" engines were produced. The output of complete aircraft during the same period was at the rate of about two machines per day.

At the conclusion of the war, the Coventry works were gradually re-established as motor-car works, and the aircraft side was transferred to new works built on the aerodrome at Whitley, some 2 miles from the factory at Coventry. The aero engines are still being manufactured at the Coventry works, and in this connection it might be worth while mentioning that all aircraft produced by this organisation are known as Armstrong-Whitworth aircraft, while the aero engines bear the name of Armstrong-Siddeley. Thus one speaks of an Armstrong-Whitworth "Siskin" or "Atlas" fitted with Armstrong-Siddeley "Jaguar" engine.

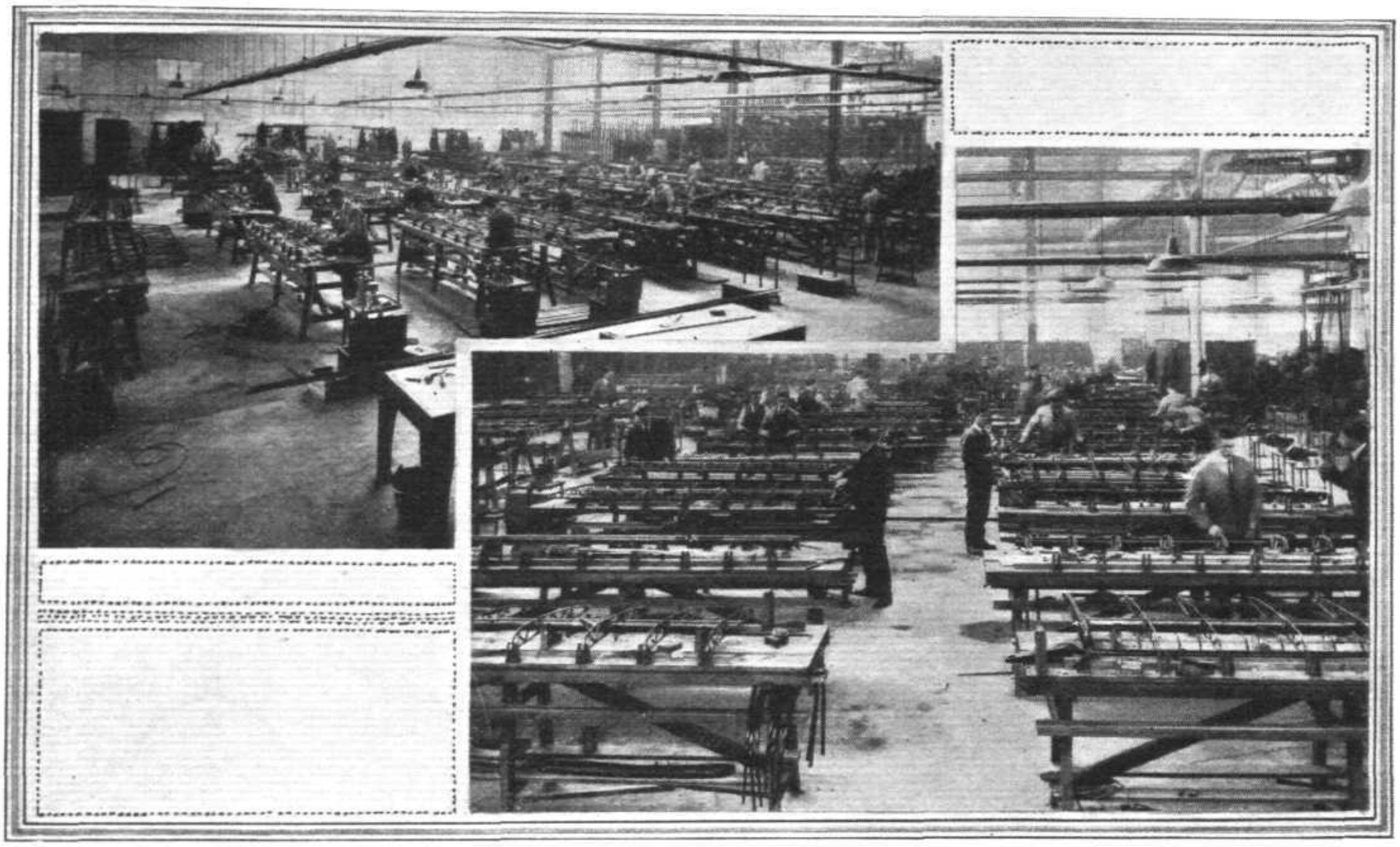
The Armstrong-Whitworth works at Whitley are very large and have been planned on up-to-date lines, all-metal construction having definitely been decided upon before building the works, and before the British Air Ministry decided that in future all service aircraft was to be built entirely of metal. This fact should be kept in mind, since it shows that the Armstrong-Whitworth company chose metal on technical grounds and not merely as a result of being compelled by a change of policy to do so. The firm received an early reward for its foresight, in the form of large orders for "Siskin" single-seater fighters, which were the first all-metal machines to be issued in quantities to the Royal Air Force. The first of these were produced as long as six years ago.

When the Armstrong-Whitworth factory commenced work at Whitley, it had already, as previously pointed out, been decided to concentrate on metal construction. Moreover, it had been decided that the chief constructional material was to be steel, those responsible for the policy of the firm holding the view that steel, being a metal of well-known properties and well tried reliability, was the logical material for aircraft where, perhaps, more than in any branch of engineering, it is important to remember that the chain is only as strong as its weakest link.

It was our privilege to visit recently the aircraft works at Whitley, and to have an opportunity not only of seeing for ourselves the work that is being carried out there, but to have the various processes explained to us by Maj. F. M. Green, who is chief engineer of the Armstrong-Whitworth and Armstrong-Siddeley concerns. During the visit, material was collected for the following notes and illustrations, and as these are to appear in FLIGHT and not in THE AIRCRAFT ENGINEER, an attempt will be made to describe typical Armstrong-Whitworth forms of metal construction without going into technical details that would merely bore the non-technical reader.

In developing metal construction, certain aircraft firms have pinned their faith almost entirely to solid-drawn tubing; others have preferred to use the metal in strip form, turning it into the desired sections either by passing it through a series of rollers or through a series of dies, the former method being known as rolling and the latter as drawing. Armstrong-Whitworth metal construction makes use of both forms of construction, circular-section tubes being employed where this form of member is considered most suitable, and rolled or drawn members where such refinement is regarded as being worth while.

Tubular construction is confined almost entirely to the fuselage of Armstrong-Whitworth aircraft, the members of a fuselage mainly carrying compression and tension loads, and but few bending loads. In other words, the members are chiefly acting either as struts or ties, for which purpose

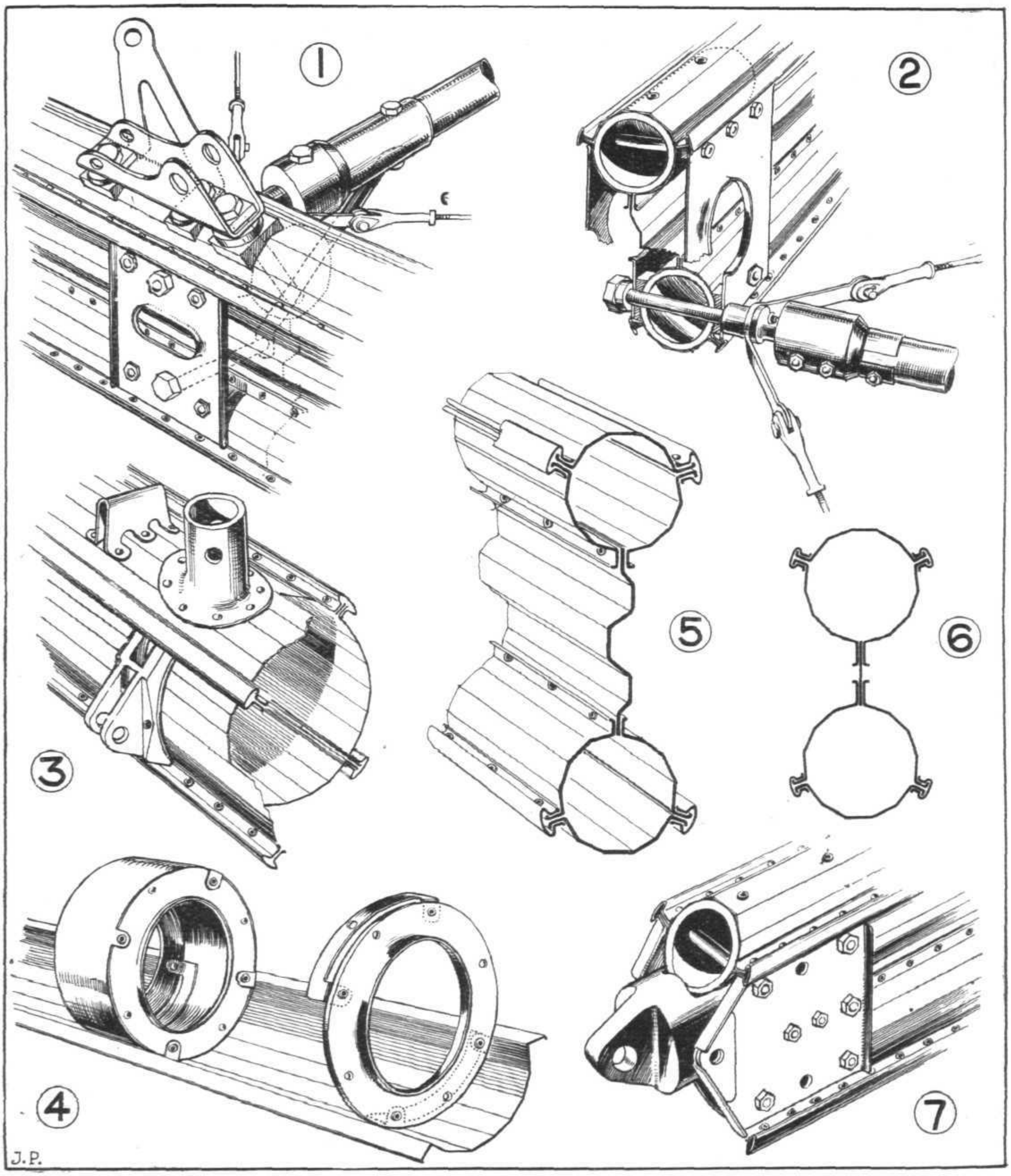


ARMSTRONG-WHITWORTH METAL CONSTRUCTION: Two Views in the Wing Assembling Shop.

the circular tube is particularly fitted. Steel strip construction is employed in the wings, and more especially in the wing spars, where combined bending and end loads are to be met with.

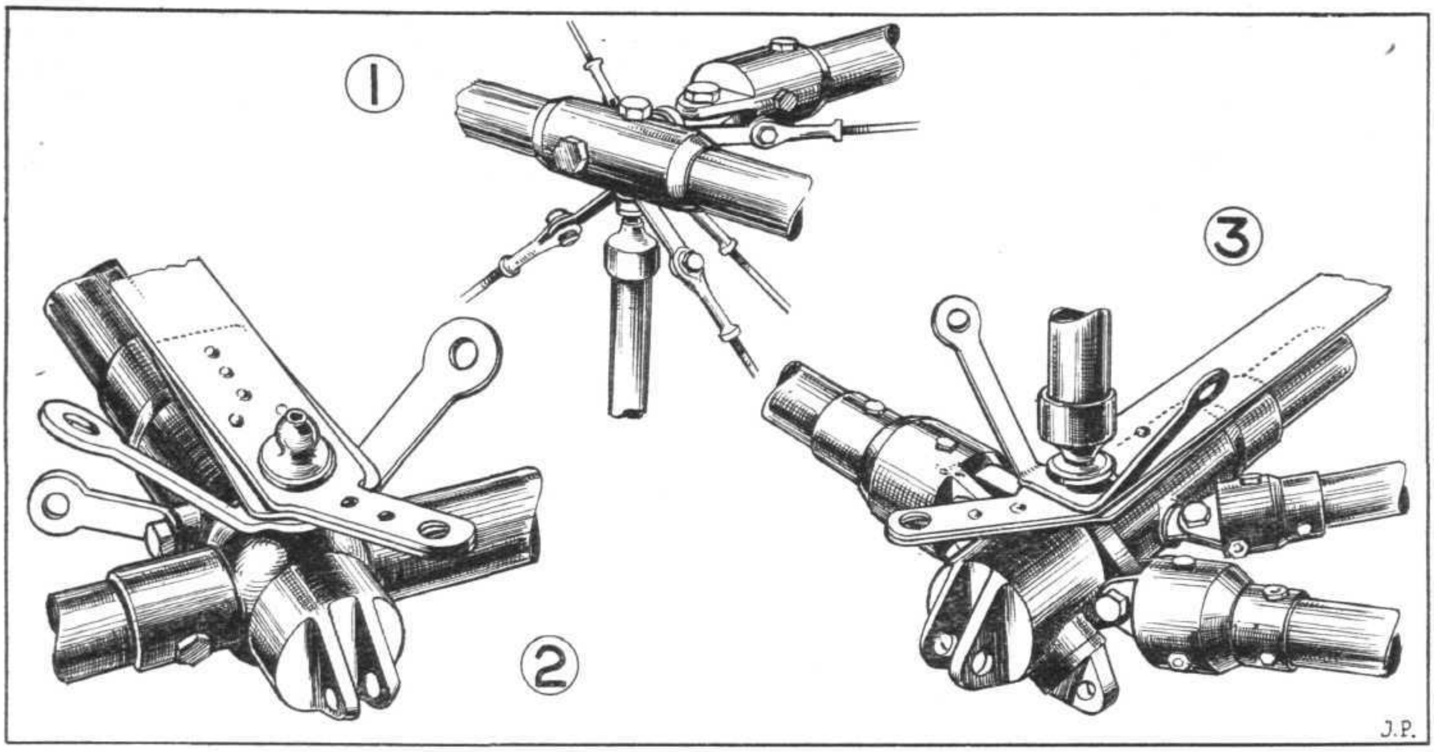
The Fuselage Structure

When employing circular-section steel tubing in a fuselage structure, two distinct methods of joining struts and longerons are in general use: welded and mechanical joints. Welding is a cheap and easy method where small quantities are concerned, but only certain classes of steel can be joined by welding, and many hold that one can never be *entirely* certain whether a welded joint is sound or not. Practical experience seems to indicate that welding is not as "unmechanical" as some would have us believe, but apart from that question altogether a very good case can be made out for using other forms of joining. For instance, by employing a mechanical joint high-tensile steels can be used, which have a greater strength/weight ratio than the steels which can be welded, and which are therefore claimed to give a somewhat lighter structure for equal strength. Also it is possible that in an emergency,



["FLIGHT" *Sketches*

ARMSTRONG-WHITWORTH STEEL STRIP WING SPAR CONSTRUCTION: 1, shows a spar with drag strut and inter-plane strut fittings. Note that the drag strut is attached not on the neutral axis, but near the edge of the spar. Details are shown in 2. An aileron torque tube is illustrated in 3, with its fittings, etc. Note that the torque tube is built up of four strips, and stiffened internally, as shown in 4. The main wing spars are of the section shown in 5, with built-up tubular flanges of polygonal section and corrugated webs. A similar spar, but of less depth, and therefore having a plain shallow flange is illustrated in 6. The end fittings of such a spar are shown in 7.

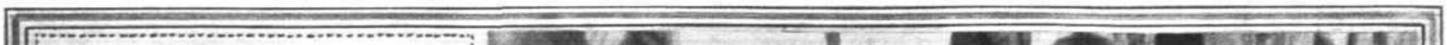


["FLIGHT" Sketches

ARMSTRONG-WHITWORTH METAL FUSELAGE CONSTRUCTION : 1, shows a typical fuselage joint. Note the use of ball and socket joints in the vertical side panels. A joint between lower longeron, vertical strut, wing attachment and lift wire, etc., is shown in 2, while 3 shows a similar joint, but for the rear spar. At this point also the direction of the longeron changes, so that a forging carrying lugs for the fork ends is used.

if really large output should be required, forms of construction using mechanical joints would be quicker than those using welded joints, and certainly less skilled workers are required for assembling tubes on a jig with bolts and fishplates than would be necessary for carrying out welding operations.

It was probably considerations such as these which led the Armstrong-Whitworth engineers to choose mechanical joints in their fuselage construction. The actual forms which typical Armstrong-Whitworth fuselage joints may take are shown in some of our sketches. The tubular longerons, which form, of course, a series of straight lines, the gradual curvature of the finished fuselage form being obtained by the addition of formers and stringers to carry the covering, have short sleeves slipped over them and bolted in place at the points where the vertical and transverse struts are to be secured. Each sleeve is located on its longeron by two



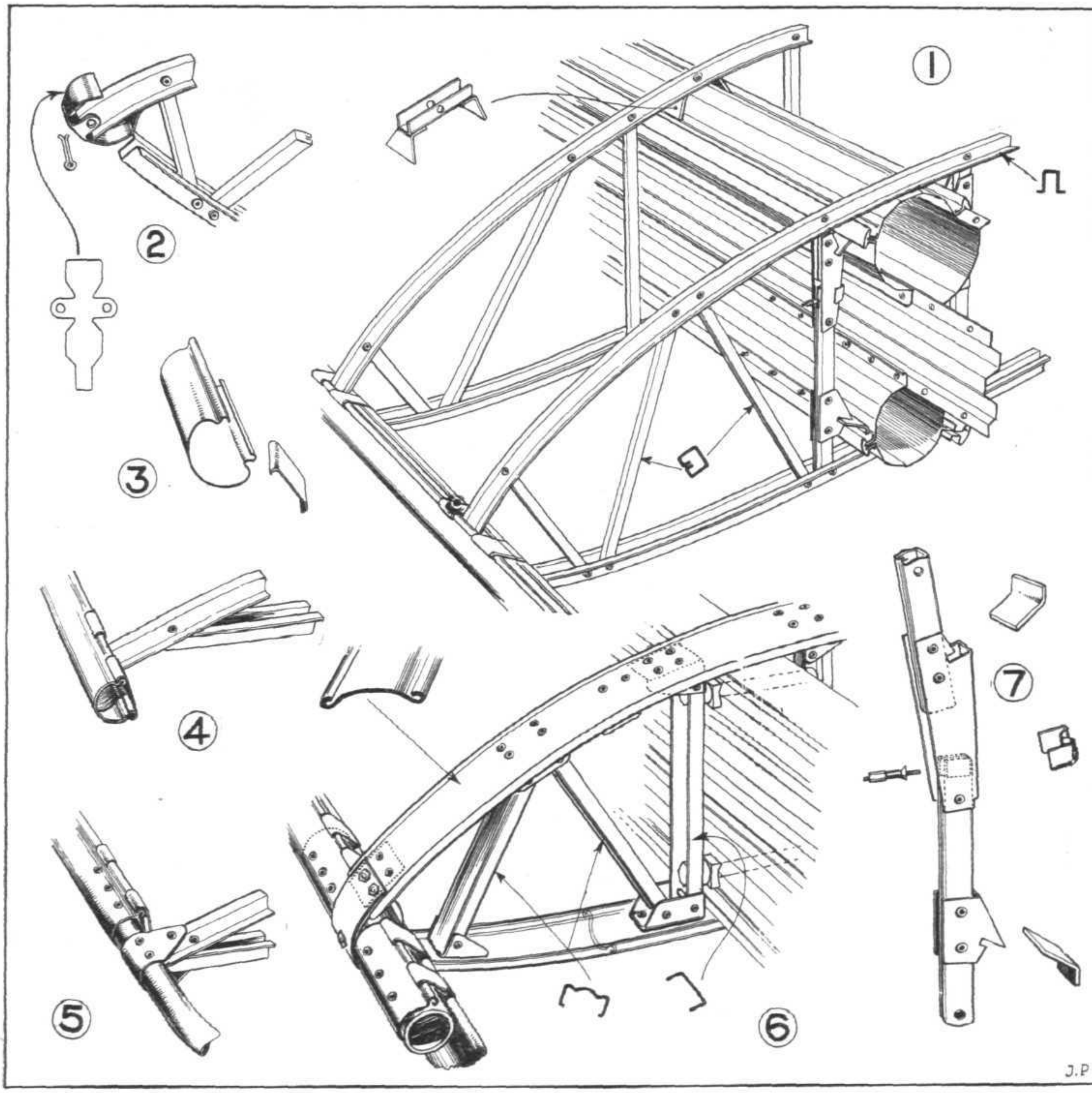
MANUFACTURING STEEL RIBS : On the right, the U-section flange of a rib being bent to shape, and on the left a rib being assembled on a jig.

bolts, one vertical and one horizontal, slightly staggered so as to clear each other. Each side of the fuselage is built up on jigs, and the two sides are then turned into a complete structure by the insertion of the transverse struts in the top and bottom bays. With this method of assembly in view, the fuselage side struts are provided with a cupped-end socket which receives the ball-shaped bolt head, as shown in our sketches. The cross struts, however, have fork-ended sockets which engage with the eyebolts. This description joint at the front spar attachment, and Fig. 3 the corresponding joint at the rear spar and undercarriage strut attachment.

The method of building up the members and units on jigs ensures strict interchangeability, not only of details but of complete units.

The Wing Structure

As the basis of the Armstrong-Whitworth all-metal wings is the steel strip spars, these will be dealt with first. The



["FLIGHT" *Sketches*

ARMSTRONG-WHITWORTH STEEL WING CONSTRUCTION : The arrangement and attachment of ribs is shown in 1. Note that the ribs are clipped in place by a toggle, details of which are given in 7. The leading edge is attached to the nose of the rib by clips, as shown in 2, 3 and 4. The trailing edge uses a slightly different arrangement, as shown in 5, which represents the point where the tubular wing tip is attached to the "D" section trailing edge. *Specially strong ribs are used in certain places, and in this case the flange is wider and of the* section shown in 6. This particular section is also used for fuselage stringers to carry the fabric.

applies to the rear portion of the fuselage, the structure of which is completed by tie rod bracing secured to wiring plates.

In the forward portion of the fuselage, slightly different joints are employed, due chiefly to the need for attaching to the joints here such items as wing spars, undercarriage struts, etc. The fittings which form the joints at these points are forgings which may be either spherical with tubular extensions or more complicated, with projecting lugs for the attachment of a number of members meeting at this point. Thus in the set of fuselage sketches, Fig. 2 shows the fuselage sketches on page 1084 show some typical spar sections, and also drag strut and inter-plane strut fittings. Two general types of spar are produced as standard, differing only in the type of web used. The standard full-depth spar consists of two booms joined by a fairly deep web, both the booms and the web being corrugated. The corrugations are not, as is more frequently the case, in the form of smooth curves but in a series of straight flats, adjacent flats being joined by curves of very small radius. The second type of spar, shown in Fig. 6

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The AIRCRAFT ENGINEER

FLIGHT ENGINEERING SECTION

Edited by C. M. POULSEN

December 27, 1928

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EDITORIAL VIEWS.

With the present issue THE AIRCRAFT ENGINEER completes the third year of its existence. We feel that its 36 numbers have proved both interesting and instructive to many of our readers, and on glancing back one finds a great variety of subjects dealt with by specialists.

Metal construction has come to the fore during the last couple of years, and THE AIRCRAFT ENGINEER has endeavoured to keep its readers informed of progress in this direction by a series of articles, among which should be mentioned in the front rank those from the pen of Mr. H. J. Pollard, of the Bristol Aeroplane Co., Ltd. Mr. Pollard is an advocate of strip construction in steel, and his company has evolved some very ingenious types of steel members, most of which have been described by Mr. Pollard in his articles, and ably illustrated by Mr. Miles. We recently had a letter from Mr. Pollard, in which he suggested that readers might be getting tired of his articles and wish to see contributions from someone else. While we should greatly like to publish the views of others, and shall be pleased to consider any contributions sent in, we feel sure that readers are far from being tired of Mr. Pollard's instructive articles, and as there are still a few subjects upon which he has something to say, we hope to continue in the new year with at least a few more articles under his signature. One appears in the present number.

During 1929 we hope to extend THE AIRCRAFT ENGINEER by giving each month a greater number of pages than we were able to include in 1928. While we do not feel that the time is ripe yet for the publication of THE AIRCRAFT ENGINEER as a separate journal, we are convinced that its pages are welcomed and are doing useful work, and with the co-operation of contributors we intend to endeavour to make it even more useful. For that to be possible, it will be necessary for a larger number of contributors to send in articles, and this we cordially invite them to do. There is no restriction as to subjects, provided they deal with aircraft engineering in some form or other. Metal construction having been treated fairly fully, we would especially welcome articles on flying boat and seaplane work.

DEVELOPMENT OF METAL CONSTRUCTION

By H. J. POLLARD, Wh.Ex., A.F.R.Ae.S.

(*Continued from page* 80)

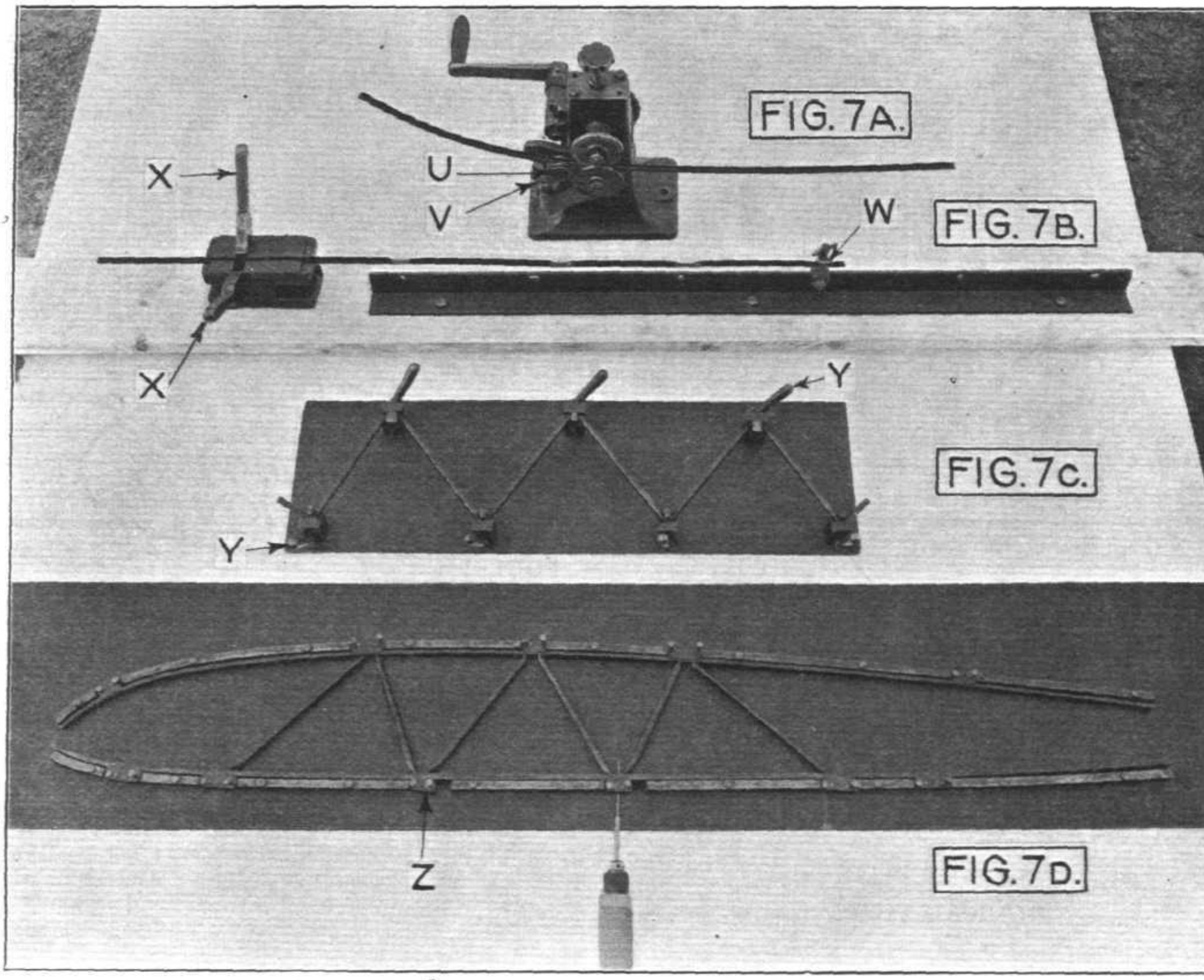
As to rib manufacture, Figs. 7*a*, *b*, *c*, *d* illustrate a method which has been practised. Fig. 7*a* shows how channel booms may be formed to any desired contour: The small roll U is capable of adjustment up and down by means of wheel V, and the channel is moved backwards and forwards in the pair of rolls which are actuated by the handle through gear wheels.

Fig. 7B shows the method used for folding over the sides of the bracing channel. The end of the channel is held in the small clamp W and this clamp is held by a pin through a hole in the angle iron. This pin is inserted successively in the series of holes shown in the sides of the angle. After each "setting" the handles X are turned over, this action folds over the sides of the channel which lies in a groove between these handles.

Fig. 7C shows how the continuous bracing channel is bent to the required shape: Small clamps are suitably spaced on a base-plate and the channel is simply bent round each clamp. A cam is rotated by means of handles Y, thus firmly grasping each portion of the channel. The booms and bracing so formed are placed in the assembly jig 7D and by means of air drills the necessary rivet holes made through boom and bracing together. This assembly jig consists of upper and lower rectangular sectioned steel bent to the requisite contour and screwed to a base-plate. The hard bushes are carried in swivelling blocks; after drilling, these blocks can be swung away from the boom and the rivets inserted and clinched, thus completing the manufacture of the rib.

Repair of these members after damage is a very simple matter provided that the damage is not such as to need the replacement of the whole component; a bent rib boom that cannot be efficiently straightened may have another channel placed over it, the internal dimensions of which are slightly greater than the external dimensions of the original boom. Similarly with the bracings; but since all rivets are easily accessible, the insertion of a new piece of rib bracing is an easy matter, as also is the replacement of a complete rib boom, if this is considered necessary.

Again, with spars and longerons repairs can be easily effected in these components by virtue of the wide riveting edges. These have purposely been kept as wide as possible (see Figs. 7 and 8, page 24, AIRCRAFT ENGINEER), so that in the case of spars, channels may be placed in the webs along the damaged portion and the shallow sides of these channels attached to the riveting edges of the spars as in Fig. 8, page 24,



but in this case this shallow channel would have no holes drilled in the base, as indicated in figure referred to. If it is preferred, lengths of flange or web may be placed over the damaged portion of the spar and secured only to the riveting edges of the member, but generally for spars buckled in the flange and web a relatively heavy gauge (say, 16G.) flat-based channel, secured to the ribs of the member only, is sufficient. At a risk of repetition of what has been said previously, it is again emphasised that this kind of repair may be readily done externally on the spar without any interior attachment.

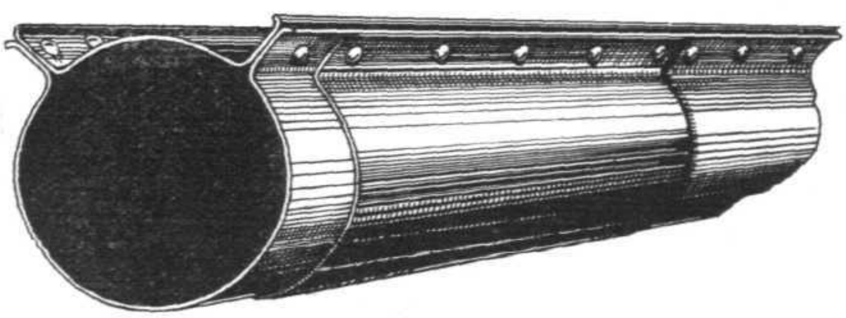


Fig. 8.

Regarding damaged spars, it may be said at this stage that local buckling of a spar flange (caused, say, by a wing tip striking an obstacle or the ground) does not necessarily mean that the aeroplane must be dismantled and taken back to the aerodrome by road or rail. A spar loaded in the manner indicated in Fig. 2, page 23, until the compression flange buckles would most probably on a re-test still support half or even three-quarters of the total load carried during the first test and a spar similarly buckled would consequently be safe for a cross-country flight. A more serious matter might be the deformation of the whole wing and the consequent alteration to its aerodynamic properties. In the event of part of a spar being fractured, particularly in the tension flange, repair or replacement would be imperative before the machine could be used.

As regards fuselage members, longerons and struts, if the major portion of a longeron is damaged (dented) a patch of section and gauge identical with that originally used may be sprung in place and riveted to the two lips. It is, of course, necessary to allow the patch to extend a few inches on either side of the dent. Such a repair is shown in Fig. 8.

Since metal construction development has been mainly in Service aircraft, this matter of repair has necessarily been kept well to the fore. In commercial aircraft the need for repair, that is repair to a damaged structure, should be negligible compared with possible damage to military machines, nevertheless, experience has shown that facility for repair in a member can quite well be included in the design without serious sacrifice of either weight or developed strength, and there is reason to believe that in future constructions or higher developments of the art of metal construction, efficiency of members and the ease of repair will, in good design, continue to be complementary characteristics.

AIRCRAFT ENGINE TESTING

By G. H. WALKER, M.I.Mech.E.

The testing of aircraft engines calls for more than usual care in the selection of testing plant. The safety of passengers, pilot and aircraft; adherence to scheduled time tables; the load-carrying capacity, efficiency of performance and economy, depend very largely upon the correct functioning of the aircraft engine. It is therefore a natural consequence that manufacturers and users should take great pains to

ensure that before use in aircraft their engines should attain a high standard of efficiency and reliability.

The Air Navigation regulations at Home and Abroad require that this standard of performance should be put to the proof by actual test. The requirements of the British Air Ministry in this respect are set out in printed form and stipulate that—

(a) the brake torque or load on the engine can be varied without stopping the engine;
(b) the horse-power or torque developed can be measured by means of the torque reaction of the brake or of the engine;
(c) adequate cooling facilities are provided for all types of engines;
(d) suitable means for accurate determination of the consumption of fuel and lubricating oil are available.

The measurement of power by torque reaction may justly be regarded as an "absolute" method, giving readings which are beyond reasonable dispute, provided that the measuring device is correctly adjusted. The apparatus consists merely of an accurate weighing machine measuring the force arising from the development of power at a known distance from the axis of rotation. Other systems, involving a hypothetical correction to compensate for inaccuracies inherent in the testing plant, are prohibited by the British Air Ministry and other authorities. The only corrections permissible are those applying to fluctuations in the density of the atmosphere, which govern the maximum power capable of being developed by the engine.

A device which fulfils the requirements of the British Air Ministry, and by reason of its dependability and convenience in commercial use has been adopted on a large scale in all parts of the world, is the "Froude" Hydraulic Dynamometer. This machine is so well known that a detailed explanation is hardly within the scope of this article, but an illustration appears in Fig. 1 and a cross section in Fig. 2. The engine undergoing test is direct coupled to the shaft of the machine upon which is keyed a rotor revolving inside a casing filled with water and having sluice gates operated by external screwed spindles, by means of which the resistance to rotation can be regulated. Power is absorbed by hydraulic interaction between rotor and casing. The latter is mounted upon ball-bearing trunnions in such a way that all forces resisting rotation of the shaft, whether they arise hydraulically or by solid friction at glands or bearings, tend to turn the casing on its trunnions and transmit the torque to a weighing device connected to the casing by an arm, the effective length of which is known.

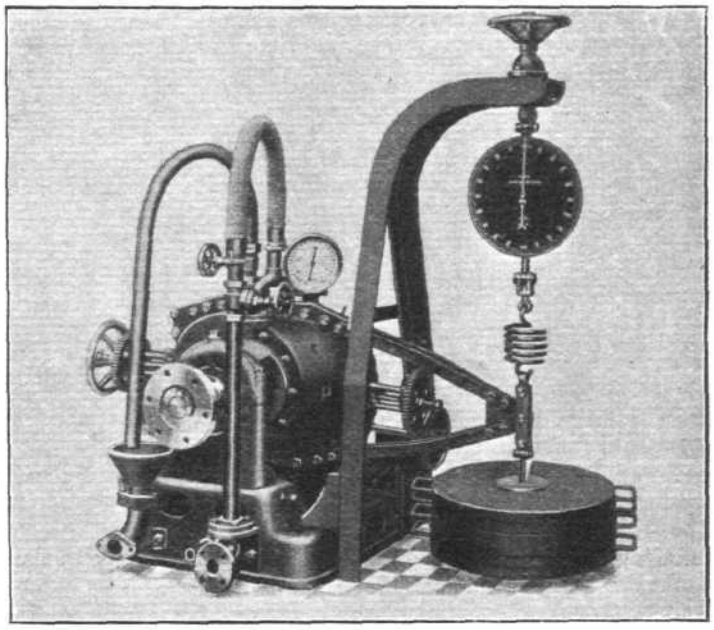


Fig. 1. Froude Dynamometer, Type D.P.X.

The power-absorbing capacity of this machine is somewhat surprising in relation to its small size. It is built in standard sizes to absorb the power of the smallest up to the largest aircraft engines, and in another form than that illustrated, for

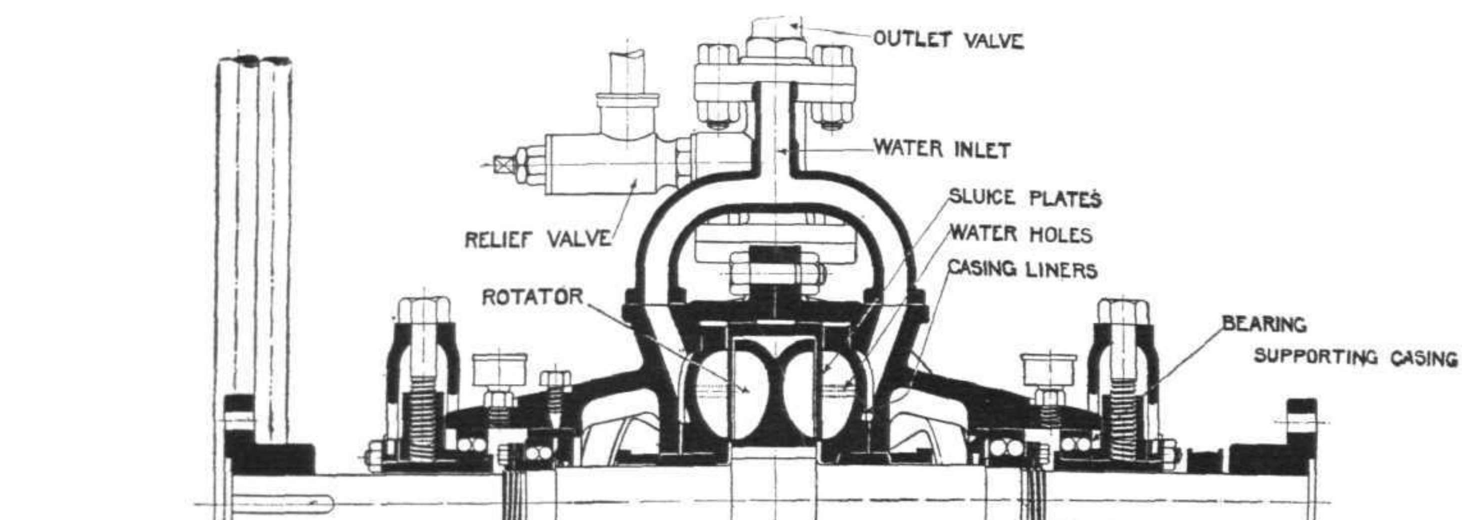
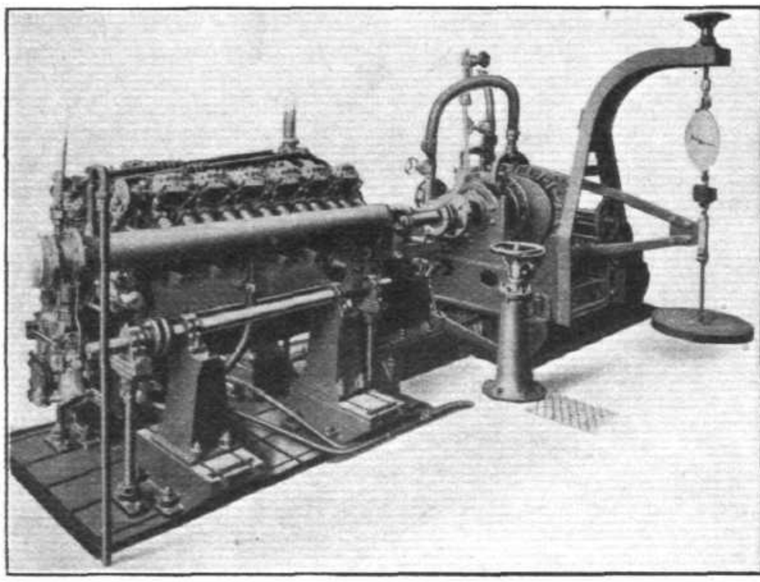


Fig. 2. Cross-sectional Arrangement of Froude Dynamometer, Type D.P.X.



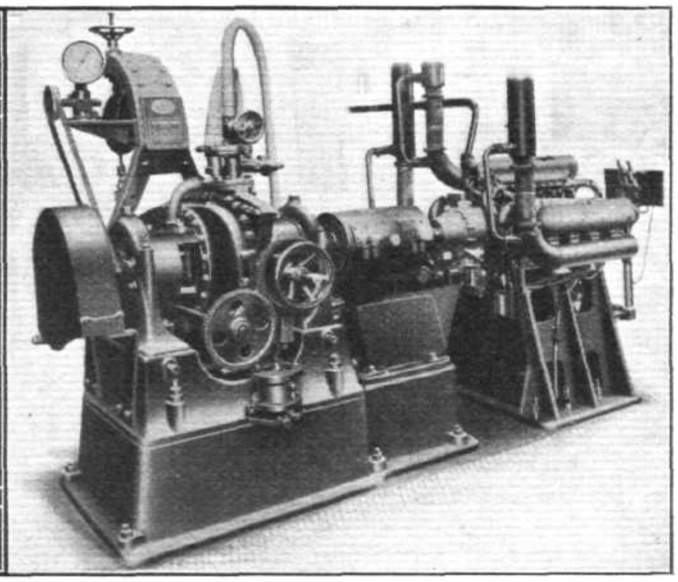


Fig. 3. Froude Dynamometer testing a Rolls-Royce "Condor" Engine, and, on right, Fig. 4, testing a Napier "Lion."

testing large internal-combustion engines such as Marine Diesels of immense power.

As applied to an aircraft engine, the load can be adjusted by a single handwheel while running, to very fine limits of speed and torque, and we have observed running installations showing every effect of engine tuning adjustment, even to the extent of 1 b.h.p. in 500. Fig. 3 shows one of these dynamometers testing a "Condor" engine, type IIIA at the works of Rolls Royce, Ltd., Derby, and Fig. 4 a similar dynamometer testing a "Lion" aircraft engine at the works of D. Napier & Sons, Ltd., Acton.

A problem arises, in testing air-cooled aircraft engines, connected with ventilation. It is, of course, essential that the engine should be allowed to work in a stream of air flowing, at velocities equivalent to those experienced in flight, over the heat-radiating surfaces. In the absence of adequate provision for ventilation, the engine would fail to operate satisfactorily and the brake horse-power developed would be appreciably under standard.

In cases where the engines to be tested are practically all of the same kind running at substantially similar speeds, although not necessarily developing similar powers, a satisfactory dynamometer is the "Heenan-Fell" air brake, a description of which has been published elsewhere. This is shown in cross section in Fig. 5, from which it will be seen that the engine drives a centrifugal fan impeller blowing air at high velocity over the engine, which thereby provides its own ventilating blast. Power is regulated by a shutter controlled from the exterior of the casing and sliding over the periphery of the impeller, so as to vary the volume of air discharged and therefore the power consumed. The power is measured by torque reaction upon the crankcase of the engine.

In many cases, however, the range of engine sizes is so considerable that a more flexible plant becomes necessary. The introduction of gearing into the design of an engine which has previously been made for direct drive, changes entirely the speed and torque without necessarily altering the power. High-performance engines again require a more generous blast of cooling air than those produced for commercial purposes. Thus, the conditions of the test are directly affected and provision must be made to meet them.

The Bristol Aeroplane Co. have purchased from Heenan and Froude, Ltd., specialists in engine testing plant, a number of wind tunnels, the design of which offers a satisfactory solution of these problems. An illustration of one of the wind tunnels recently set to work at Bristol is shown in Fig. 6. A Bristol "Jupiter" aero engine is mounted upon a

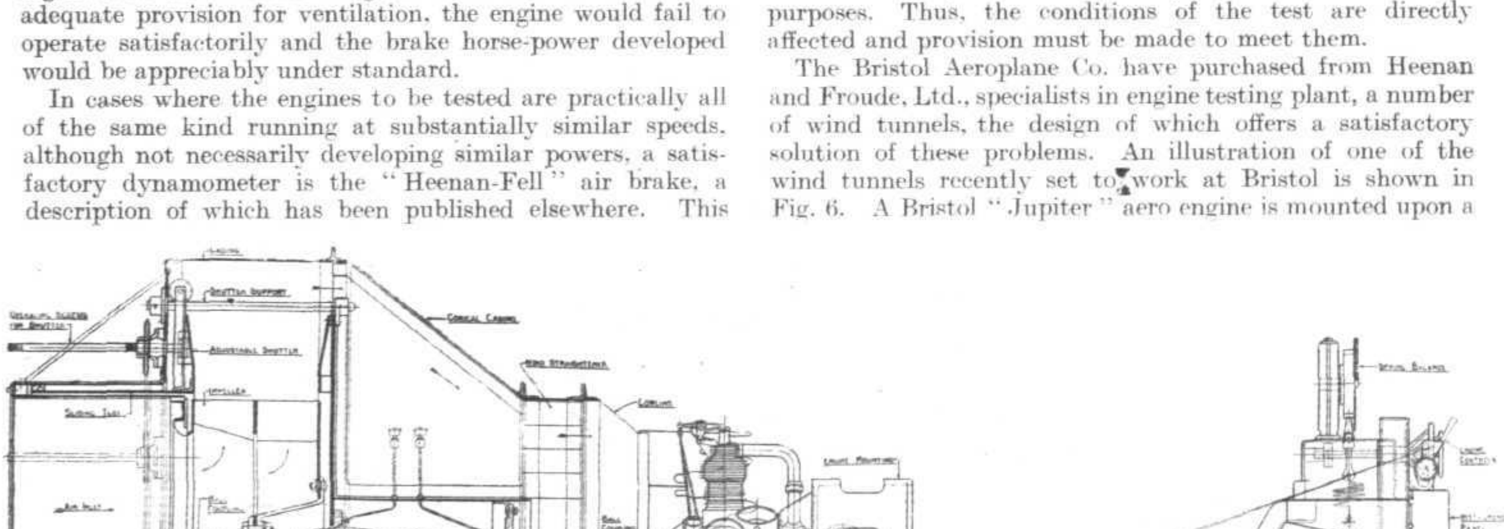


Fig. 5. Cross-sectional Arrangement of Heenan-Fell Air Brake Dynamometer.

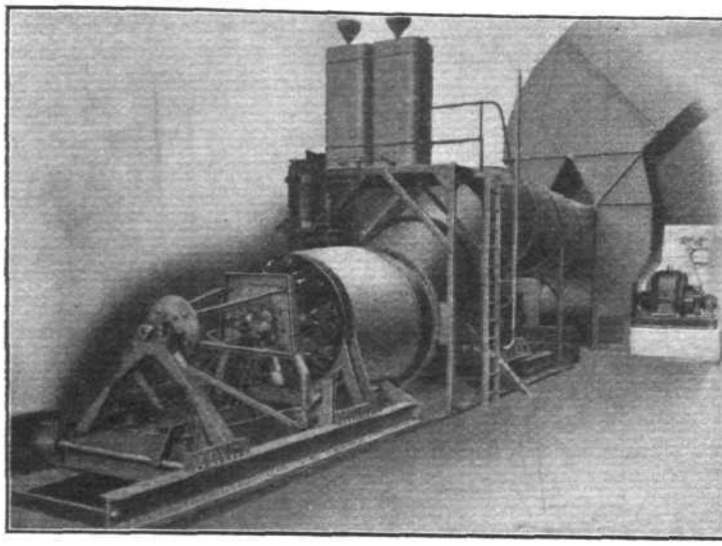
cradle supported at the front end upon rollers and at the rear end, remote from the engine, upon a pivot bearing, so that under the influence of torque reaction the cradle can rotate to a limited extent about the same axis as the propeller shaft. Spring loaded anchorages restrain the motion of the cradle and cushion the inequalities of torque which arise from the impulses of the engine. The complete cradle and engine can be racked towards or away from the open mouth of a large wind tunnel, so that in setting up and adjustment, prior to or following a test, access to the engine is unobstructed.

After being mounted upon the cradle, the engine is fitted with an adapter enabling the propeller shaft to be connected through a flexible cardan shaft to a transmission shaft supported in ball bearings, which delivers the power to a "Froude" hydraulic dynamometer. Under running conditions, the entire power of the engine is absorbed and accurately measured by this machine.

Running over the top of the dynamometer and thence by easy bends towards the open orifice facing the engine, is a large wind tunnel constructed in heavy steel plate conveying air from a high speed, high pressure "Heenan" centrifugal fan designed especially to meet the exceptional requirements of test shop practice, and capable of running continuously under the heavy duties created by centrifugal force and dynamic load. A close-up view of the fan and its driving motor appears in Fig. 7. The entire construction is heavy and substantial and the freedom from vibration at all loads and speeds is extraordinary. The last-mentioned illustration shows an electric motor of the variable speed pattern rated for 300 maximum B.H.P. and capable of giving air velocities over the engine of well over 130 m.p.h. In an adjacent test shop of the Bristol Aeroplane Co., Heenan and Froude have erected another wind tunnel driven by a variable speed motor of 550 b.h.p. and giving wind speeds past the engine well in excess of 180 m.p.h. On overload, the official test conducted shortly after starting up this plant showed wind speeds of 197 m.p.h.

It does not, of course, follow that the high wind speeds cited above are commonly used to pass out engines. Normal testing demands an expenditure of fan power in this particular wind tunnel of the order of 200 b.h.p., but for high-performance engines and for a variety of development work, the ability to command very high wind speeds puts the Bristol Aeroplane Co. into an exceptional position and enables them to investigate features of engine design which they would otherwise be severely handicapped in doing.

With their wind tunnels, Heenan and Froude supply very complete equipment and accessories, including such items as engine control levers, switches, gauges, thermometers, air speed indicators, tachometers, speed counters, etc. For fuel supply and measurement are included petrol tanks, strainers, flowmeters, and in the oil circulating system are inserted oil coolers with electrical heating devices and strainers. For running-in new engines and starting-up purposes, they supply a specially designed electric motor connected to the free end of the dynamometer shaft through a self-disengaging jaw clutch and having various safeguarding devices which protect the bearing surfaces of the engines against undue load while they are being run in.



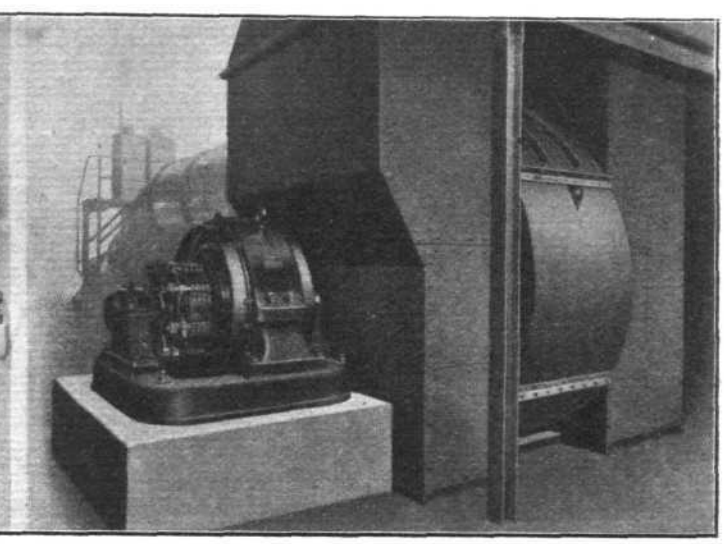


Fig. 6. Froude Wind Tunnel Testing Plant at the Works of the Bristol Aeroplane Co., Ltd., and, on right, Fig. 7. Centrifugal Fan and Driving Motor.

This type of wind tunnel testing plant appeals to a very wide circle of aircraft engine users owing to the enormous range of powers and speeds and types of engines with which a single plant will deal. For instance, it is commonly possible to test engines varying in power between 80 and 1,500 b.h.p., whether they are air-cooled, water-cooled, direct drive or gear drive, and in some cases whether they run in the right-hand or left-hand direction of rotation. The convenience

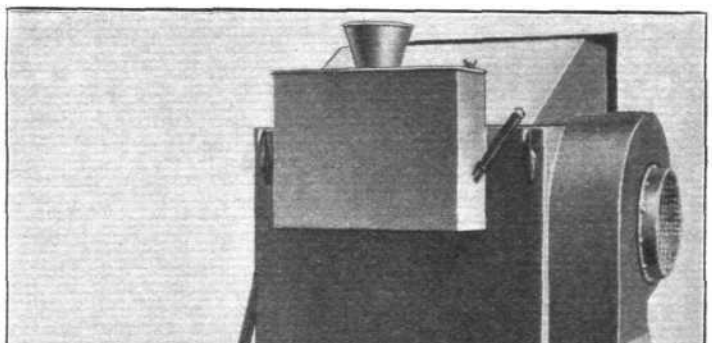


Fig. 8. Heenan V-type Water Cooler.

of this degree of flexibility to a Government establishment or air line using a variety of engines is immediately apparent. Sufficient margin is inherent in the design to cater for considerable alteration to type of engine and for future development.

As an instance of this facility may be cited the case of the Argentine Naval Commission, who have recently entrusted to Heenan and Froude an order for a wind tunnel plant to be installed at the Argentine Naval Aviation Station of Bahia Blanca (South America) closely following the lines of those described above, capable of testing a great variety of British and foreign engines, geared and direct-drive patterns, air cooled and water cooled, running in both directions of rotation. The plant is complete with centrifugal fan, variable speed electric motor, inlet duct, wind-tunnel proper, engine cradle with mountings and adapters to suit various engines, platform supporting fuel tanks, fuel measuring, cooling and heating devices, "Froude" dynamometer, starting motor and water-cooling equipment. The last-mentioned item consists of a "Heenan" V-type cooler as illustrated in Fig. 8, fitted with centrifugal circulating pump, driving motor and mixing tank by which the temperature of the water in the cylinder jackets may be closely adjusted. This cooler renders the test shop independent of external supplies of water, both for engines and dynamometer. With the aid of this plant the purchasers will be in a position to undertake all normal tests for maintenance, check the performance of repaired engines, tuning up, and if they so desire, conduct their own research work.

ANOTHER CHEAP SINGLE-SEATER DESIGN, "THE BEETLE"

By ROGER S. DICKSON

This machine is an all metal single-seater light aeroplane designed to give a useful speed range, and is suitable for the owner-pilot who requires a simple machine of the "sports" type at a low price, as opposed to the fairly high-priced dual controlled two-seaters at present on the market.

The engine fitted is a Bristol "Cherub III" of 33-36 h.p. This engine is extremely economical to run, having a consumption of only 2 gallons per hour of petrol and a correspondingly low oil consumption. The machine was really designed to suit the 980 c.c. J. A. Prestwich engine as fitted to some of the higher priced motor-cycles. This engine is already manufactured in large quantities, and with slight modifications would form an ideal cheap engine for a low powered aircraft.

The landing speed is 40 m.p.h. without slots, which is low enough for the average pilot. The top speed is 96 m.p.h. which is high for such a small engine.

This machine having very large control surfaces is controllable to a high degree, and should form an ideal machine for the owner-pilot who contemplates entering for the various events in the ordinary flying meeting of to-day.

"The Beetle" can be built in two models :—

(1) A simple cheap model with no slots, a non-steering tail skid and a simple rubber-cord undercarriage.

(2) A better class job with slots, steering tail skid, high-class undercarriage and other refinements.

This machine should sell at £250–£300 under modern production methods, and if sold in large quantities could be a press tool job, at an even lower price. FLIGHT predicts that a model like the "Beetle" should sell at the rate of ten to each one of the standard two-seater type.

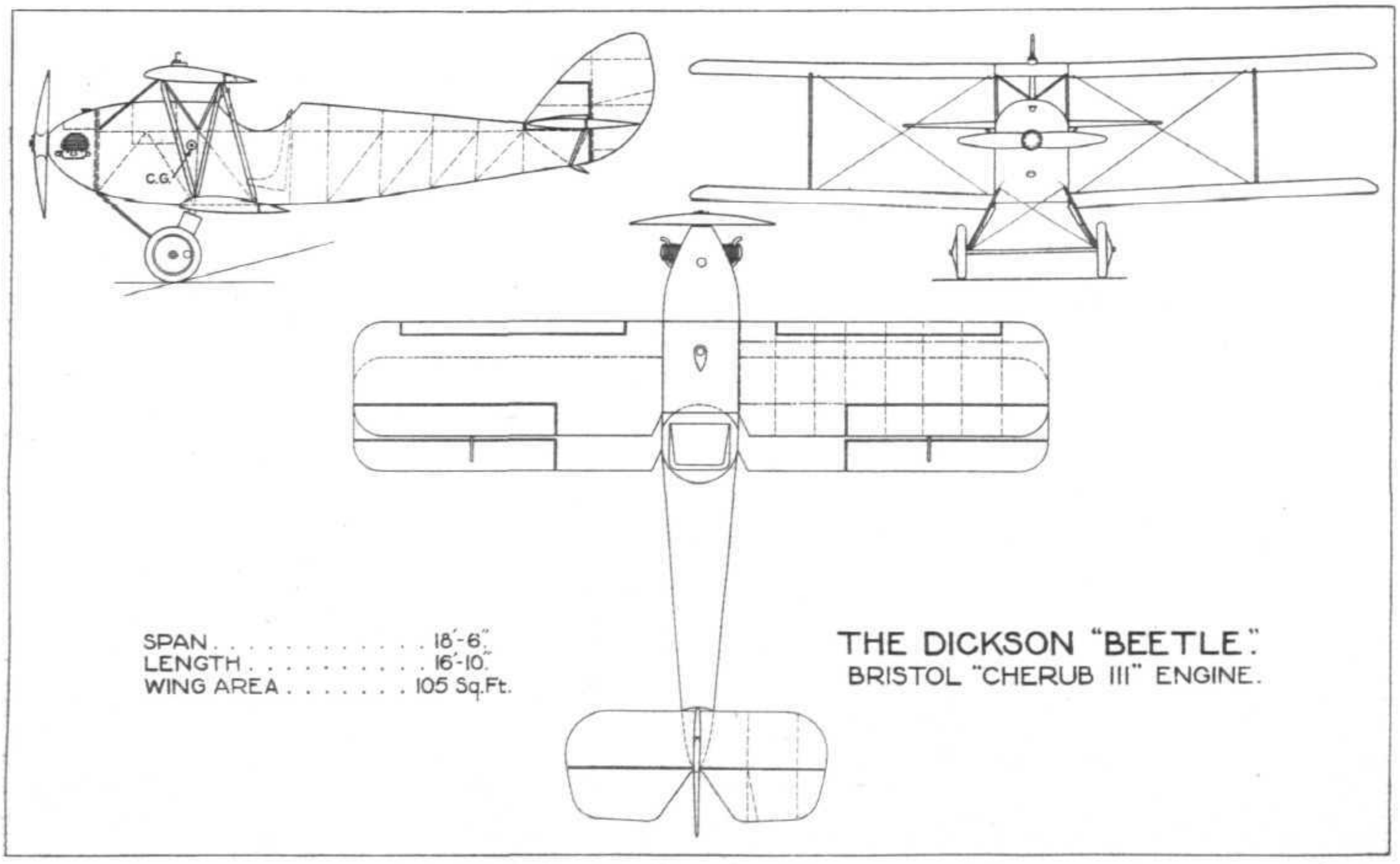
The machine is very small and the construction can be extremely simple, owing to the fact that the natural stiffness of duralumin is enough to cover buckling stresses on very small areas.

The fuselage is built in two parts, the front portion being a box construction of duralumin plate stiffened with duralumin angles, and the rear portion a simple framework of light gauge duralumin angles. An extremely simple form of tail trimming gear is fitted.

This machine can be used commercially for small urgent mails or for press photography, and also in the Service as a cheap army co-operation machine for dispatch carrying.

The leading particulars are as follows :—

Engine weight, dry	100 lbs.
Normal horse-power	33
Maximum ,, ...	36
Normal r.p.m.	2,900
Maximum ,, ...	3,200
Petrol consumption	0·58 pint/B.H.P./hr.
Oil consumption	0·023 ,, ,,
Petrol capacity	8 gallons.
Oil capacity	½ ,,



The Dickson "Beetle": General Arrangement Drawings.

Main Dimensions

Length overall	16 ft. 10 in.
Span	18 ft. 6 in.
Chord top and bottom	3 ft.
Area of main planes	105 sq. ft.
Area of tail plane	15 sq. ft.
Area of rudder and fin	8 sq. ft.

Weights

Weight empty	326 lbs.
Fuel and oil	64 lbs.
Pilot	170 lbs.
Luggage	40 lbs.
Total loaded weight ...	600 lbs.
Wing loading	6·1 lbs./sq. ft.
Power loading	15·4 lbs./h.p.

Performance

Speed at ground level	96 m.p.h.
Optimum cruising speed ...	80 ,,
Landing speed	40 ,,
Range at full throttle	300 miles.

LECTURES AND PAPERS

SOME RECENT PAPERS READ AT R.Ae.S.

AERO ENGINE PROBLEMS IN FLIGHT.

The paper read by R. J. Penn before a joint meeting of the Royal Aeronautical Society and the Institution of Automobile Engineers on November 15 dealt with the problems leading up to the final approval of an aircraft for flight, and the methods of testing additional parts of the power plant provided by the aircraft constructor, as well as the manner of circumventing the de-tuning that occurs when an aero engine leaves the ground.

The lecturer dealt first with the subject of oil systems, and pointed out that problems arise chiefly in connection with cooling the oil in small aircraft of short flight duration, owing to the small heat reservoir. The task of the aircraft constructor is complicated by the variation in types of engines, these varying both in ground-temperature rise across the engine and in rate of circulation, the former between 10° C. and 60° C., and the latter between 35 and 180 gallons per hour. The high rate of circulation has two effects: (*a*) The cooling problem is aggravated because more heat is brought away from the engine; and (*b*) Aeration of the oil becomes more pronounced since the scavenge pump has a capacity of 50 to 150 per cent. greater than that of the pressure-feed pump, and must frequently be returning air to the tank. For this reason a large air space is required in the oil tank. Fortunately, the ground rise in oil temperature across the engine is not maintained during a climb, as the power of a normally aspirated engine falls off with height. For instance, in a 400 h.p. short-duration aircraft, in which the initial rise in temperature is 40° C., coolers having an initial drop in temperature of about 7° C. have proved adequate. With supercharged aircraft, however, the power is maintained, and necessitates much larger coolers. Reference was made by the lecturer to the Vickers-Potts oil cooler, which is formed of thin elements and thus lends itself readily to increase or reduction in size according to requirements. Brief mention was also made of the turbine centrifuger, which not only cleans and de-aerates the oil but also cools it, and the lecturer expressed the view that considerable use will be found for this cooler, which is incorporated in the oil tank, requires no stays or supports, creates very little drag, and weighs very little.

Turning to the subject of the water system, the lecturer stated that the water pumps in British aero engines are always designed to circulate at least 15 gallons per minute per 100 b.h.p. of engine output, against a circuit resistance of 2 lbs. per sq. in. in excess of that of the engine, with a pressure of 4 lbs. per sq. in. below atmosphere at the inlet to the pump, whilst the water is maintained at 80° C. During climb both horse-power and air temperature decrease, but at the same time the efficiency of the radiator decreases slowly with decrease in air density. Owing to the use of shutters, the pilot can, if the radiator has sufficient cooling capacity for the climb, regulate the water temperature for all other conditions of flight, but he must remember the reduction in boiling point with increase of altitude.

When an aircraft is climbing from the ground, with water leaving the engine at, say, 75° C., the mean temperature of the system will gradually rise to a maximum and, at a certain height, commence to decrease. This is due to the fact that though the radiator capacity tends to increase gradually over the engine requirements, its maximum cooling is only attainable as the water approaches the boiling point, and since the aircraft takes off well below the boiling point, the first part of the climb is made before the radiator has reached an efficient temperature, while it can store a certain quantity of heat. The horse-power and heat input to the water is gradually diminishing, and therefore the rise in temperature from inlet to outlet of the engine also decreases. The drop in temperature across the radiator, however, slightly increases, except for a small loss of efficiency due to decrease in density. In supercharged engines this point of balance naturally occurs at higher altitudes, usually at the height to which power is maintained. Considerably larger radiators are required to deal with the higher power where the indicated horse-power may be much greater than the brake horse-power. The maximum temperature of the water at any height must lie between the temperature of boiling and the air temperature at that height. The difference in temperature between these two is known as the cooling range or maximum temperature difference. It increases with height due to the lapse rate of the air temperature being greater than that of the boiling point. Actual results of a typical flight test were then given, but these cannot be usefully summarised, and readers are referred to the forthcoming issues of the Society's Journal for details.

Petrol systems formed the next subject, and the lecturer pointed out that these are made more complicated by the necessity of alternative methods of supplying the engine to defeat enemy action, and also by the fact that the range of petrol heads varies greatly from machine to machine. All carburettor float mechanisms were not trustworthy, and it had been found that in cases of different pressure heads, the consumption had been greater where the pressure had been the higher. The main test of the system was the measurement of flow at the carburettor union under the condition of minimum head obtainable in flight, and it was the rule to have a flow 100 per cent. in excess of the engine requirements at full throttle and sea level.

The lecturer divided the petrol systems into two classes: Gravity feed, the alternative supply being obtained by having more than one gravity tank; and pump feed pressure, the alternative supply being from a gravity tank. An illustration of a system of the second type was given, showing two main tanks from which petrol could be drawn either separately or together by a windmill pump and pumped through piping and a cock to the carburettor. A gravity tank provided an alternative supply, while a fifth method consisted in placing the cock in such a position that the windmill pump would supply both the carburettor and gravity tank simultaneously. The pressures obtained in the three cases were approximately as follows: Windmill pump pressure feed from either or both tanks: 2½ lbs./sq. in.; Windmill pump feeding carburettor and gravity tank: 1¼ lbs./sq. in.; gravity feed only: 1 lb./sq. in. Taking it all round, the lecturer preferred the gravity feed, but admitted that sufficient head was not always obtainable from fuselage tanks and tanks outside the fuselage were not conducive to cleanliness of aircraft design.

On carburettors and carburation the lecturer had much to say, but space does not permit us to deal with this section of his paper in detail. He had words of praise for the Bristol "Triplex" carburettor, and also for the new Armstrong-Siddeley twin choke type A.V.T.70 carburettor designed primarily for supercharged engines.

WEIGHT OF AIRCRAFT. By Major T. M. Barlow, M.Sc. M.Inst.C.E., M.I.Mech.E., F.R.Ae.S.

On November 22, Major Barlow, Chief Engineer of the Fairey Aviation Co., Ltd., read a paper on the Weight of Aircraft.

The paper was divided into seven sections as follows: performance and weight; factors and weight; aircraft materials and weight; power unit and weight; range and weight; and finally, influence of size on weight.

The lecturer pointed out that it was difficult to treat the subject in an entirely general way, and that, on the other hand, an individual case was not helpful to a solution of the problem and might be misleading. He had, therefore, divided aircraft into three classes for the purpose of investigation:

(*a*) Fast types, as single-seater fighters and high-speed day bombers; (*b*) medium-speed types, as general-purpose military aircraft; and (*c*) slow (relatively) speed types, as large flying boats, heavy bombers, and commercial aircraft. The corresponding speeds were of the order of 200, 150, and 100 m.p.h. respectively. Other assumptions made were wing loadings of 14, 12 and 10 lbs./sq. ft. respectively, and propeller efficiencies of 75, 70, and 65 per cent. respectively. Range, landing speed, and structure strength were assumed to be constant.

A chart was shown in which increments of equivalent frontal area were plotted against increments of weight for the three general classes of aircraft, and Maj. Barlow called attention to the fact that this chart showed the marked difference in the comparative effect of weight and head resistance at altitude compared with sea level. For example, in the general service aircraft, in comparing performance at altitude 1 sq. ft. of equivalent flat plate head resistance was equivalent to 400 lbs. weight difference, whilst at sea level this increased to 600 lbs. A practical example were the air-cooled and water-cooled types built to the same specification. The extra head resistance of the air-cooled power plant could not outweigh, at the lower altitudes, the weight difference of the power plants. At extreme altitudes, however, they became equal, or the scales might even turn the other way. For the high-speed types the differences for sea level and altitude were smaller, but the weight increments were naturally larger.

In dealing with the effect of safety factors on weight, the lecturer stated that the I.C.A.N. had issued regulations basing factors on all-up weight only, with no reference to speed range, performance, or power loading. He showed a chart indicating in general the factors called for according to standard British practice, and pointed out that this chart showed definite inconsistency in making weight the deciding influence on load factors. In the case of general service type of aircraft the factors were approximately one unit factor down below those required for a civil machine (aerobatic category). There was a similar anomaly in the slower aircraft.

Taking as an example a two-seater single-bay design of which the percentage structure weights were well known, the lecturer examined the effect of changes in load factors, and arrived at the following general conclusions:—To change a 5,000 lbs. aircraft with factors C.P.F.-5, C.P.B.-4, and N.D.-1¼ to C.P.F.-7, C.P.B.-5 and N.D.-1½, involved a weight increase of the order of 180 lbs.

Under the heading of aircraft materials, the lecturer examined four wing spars made of spruce, steel tube, steel strip, and Duralumin respectively. The spruce spar was of the familiar "box" section. The tubular steel spar was that known as the "double 8" section. The strip steel spar was a fairly typical one, with drawn booms and flat flange, and the Duralumin spar was the familiar Breguet. The results were tabulated as follows:—

Spar.	Allowable Stress.	Weight Ratio.	Stiffness Ratio.
Spruce ..	5,500 lbs./sq. in.	1·00	1·00
Tubular	.. 40 tons/sq. in. (T.5)	0·75 wood/steel	0·76 wood/steel.
Strip ..	.. 65 tons/sq. in. (S.40)	1·25 wood/steel	1·24 wood/steel
Duralumin ..	17 tons/sq. in.	1·08 wood/Dural.	0·915 wood/Dural.

Petrol tanks afforded a good opportunity for saving weight by using a different material: 54-gall. petrol tanks built to the same dimensions and interchangeable as regards mounting gave the following weights:—Duralumin (20-gauge), 26 lbs.; tinned steel (26-gauge), 43 lbs.; aluminium (18 gauge), 29·5 lbs. Landing wheels also came in for consideration, and the lecturer stated that for a wheel load of about 5,000 lbs. the weight of the standard wheel was approximately 2 per cent. of the load, the figure tending to increase in higher sizes and decrease in lower, due to differences in the type of construction.

In considering the power plant and weight, Maj. Barlow pointed out that the weight per horse-power for all types of engines had decreased materially during the last ten years, and he gave a chart which showed this decrease. Both main types, air-cooled and water-cooled, had improved approximately to the same degree. There was a marked step down in weight per horse-power for the new air-cooled "V" engines, which are now experimental types in U.S.A., France, Italy, and England. An allowance of 0·5 lb./h.p. for the cooling system of the water-cooled engine might be reduced to half by the adoption of evaporative or steam-cooling. Weight would be saved when it

became possible to use, on a production basis, magnesium alloys which were 47·5 per cent. lighter than normal aluminium alloys, and had a weight-strength ratio of 1·4 to 1 in favour of the former.

As illustrating the importance of a reduction in specific fuel consumption when throttled, curves of average consumption and "ideal" consumption were shown, from which the lecturer deduced that a twin-engined machine with two engines of a nominal power of 500 h.p., each cruising at 100 m.p.h., would be capable of carrying approximately 400 lbs. extra *paying* load at a range of 500 miles if working on the lower curve of the chart. The paper did not, however, state upon what assumptions the lower curve was based. The effect of size on weight, *i.e.*, variation in lbs./h.p. with the total horse-power of the engine, was also dealt with, and it was shown that on the score of weight only, the air-cooled had the advantage up to 500 h.p. The air-cooled is not, however, available in powers of 1,000 h.p. and over. Airscrews varied from 8 to 12 per cent. of the engine weight, and the influence of their weight was appreciable. The weight ratios of airscrews designed and built for the same engine and aircraft in three materials were as follows: mahogany, 84 lbs.; hollow steel blades, 108·5 lbs.; and Duralumin, 106 lbs. From considerations of durability a return to wood was out of the question, and the lecturer saw no hope for weight reduction until they could use some of the new lighter magnesium alloys, in which the corrosion problem, aggravated by erosion, was acute. The increase in engine power, involving gearing, meant larger diameters and increased weight.

The relationship of range and weight was examined next. Taking an all-up weight of 6,500 lbs. as an example, curves were shown which illustrated that if the fuel consumption were varied from 0·6 lb./h.p./hour to 0·5 lb./h.p./hour, the range would be increased from 780 miles to 930 miles. By way of arriving at a solution of the problem, Maj. Barlow next took a "wing only" machine, *i.e.*, one in which the parasite resistance was so small that its influence could be neglected. With the normal method of take-off, *i.e.*, acceleration from airscrew thrust only, long range, he said, inevitably meant an association of wing and power loading which just enabled a heavily-laden machine to stagger off, and this limit was being approached at $W/s = 20$ and $W/p = 30$. The wing was assumed to have suitable aerofoil characteristics (minimum profile drag in the region of 0·40 lift coefficient) and an aspect ratio of 7·5.

In the case of the "flying wing," the weight of structure suitable for cantilever construction was, the lecturer said, unlikely to be less than 25 per cent. of the total weight. Other figures taken for purposes of calculation were: power plant weight, 2¼ lbs./h.p. installed; fuel at 7·28 lbs./gallon; and tankage, 0·50 lb./gallon. Curves of B/W (B being the resistance in equivalent square feet, and one equivalent square foot having a drag coefficient of 0·65) for consumption of 0·50, 0·55, and 0·60 lb./b.h.p./hour were given, which indicated that for a "flying wing" the limit of range was reached at 50,000 lbs. all-up weight, the maximum range being just over 9,000 miles for a consumption of 0·5 lbs./b.h.p./hour and correspondingly less for the greater consumptions. By way of comparison and to show the importance of aerodynamic cleanness, curves were also given for the same consumptions, but for values of B/W of 0·001 and 0·002. As was to be expected, these gave ranges very far short of that estimated for the "wing-only" case.

The concluding section of Maj. Barlow's paper was devoted to a consideration of the influence of size on weight. Referring to the recent paper by Herr Dornier the lecturer said that an analysis of the data contained therein had confirmed his (Maj. Barlow's) opinion that there were no reasons, theoretical or practical, why the flying boat should not be developed immediately to a size and weight which had hitherto only appeared in those wonderful artists' dreams of air transport ten or twenty years hence. There were definite limits to the size and weight of aeroplanes of the land type as distinct from flying boats. Freedom of munition construction and freedom of use or action when constructed formed the key to all modern war operations, and it was interesting to note how restrictions under these conditions affected super-large aeroplanes. Freedom of construction was limited to a size the main units of which could be transported by ordinary means over rail or road. The alternative was construction, in addition to erection, at definite aerodromes suitable for the type of aircraft, an impossible "proviso" under war conditions when practically all engineering shops must turn over to production of war material. An additional point was that all aerodromes would be the principal bases to be attacked by air. It was possible to transport by road units up to approximately 60 ft. long by 15 ft. high and 12 to 13 ft. broad without much difficulty. On this basis one arrived at a size of 160 ft. span which, on a normal biplane design, gave an all-up weight of 45,000 lbs.

In the case of the flying boat, the limits outlined for landplanes disappeared for both military and civil types. "Aerodromes" were available in all natural harbours, etc., and construction could be carried out at any suitable waterside where the necessary engineering shops and slipways were available. The size of flying boat could be increased with confidence as design developed, especially as seaworthiness increased with size as in ordinary seacraft.

SOME ASPECTS OF THE PRODUCTION PROBLEM IN AIRCRAFT. By F. Sigrist, M.B.E., A.F.R.Ae.S.

In the introduction to the paper which he read before the Royal Aeronautical Society on November 29, Mr. Sigrist pointed out that in the construction of aircraft, no less than 16 distinct classes of craftsmen were employed. Roughly speaking, 45 per cent. was skilled labour, 35 per cent. semi-skilled, and 20 per cent. unskilled. During periods of slackness, the constructor usually endeavoured to retain the nucleus of his skilled workers, and worked restricted hours. But this was not satisfactory, inasmuch as the better class of men invariably looked for a situation in a more stable industry.

Dealing first with the question of experimental production, the lecturer thought it would be generally accepted that experimental work was costly. This was due partly to design delays, to a smaller extent to material delays, and to a greater extent to alterations in specification requirements. It was, however, possible to cut down experimental costs by the exercise of a little care. Drawings should be issued in such a sequence that there would be no delay in assembly through non-manufacture of components. Once a skeleton structure was erected, progress of detail layout was facilitated. He always endeavoured to obtain drawings of experimental machines in the following order: fuselage, main planes and centre section, engine mounting and bulkhead, tanks, flight controls, tail unit, under-carriage.

With the section of Mr. Sigrist's paper dealing with what may be termed works organisation, we have not the space to deal here, and must proceed to a summary of his remarks on actual production. In some cases, Mr. Sigrist said, there appeared to exist a "machining complex"; in other words, there seemed to be a feeling that machine shop work was expensive when compared with sheet metal work. This was almost always a fallacy. Where a machined part could be substituted by a pressing, do so by all means, but if the choice was between a complicated plate fitting and a machined part, it was usually preferable to use the latter.

In the materials field there was wide scope for selection. It was advisable to adhere to material and sizes which could be had from stock. Sand castings in non-ferrous metals should only be used on a production order as a last resort. As an alternative one could use a duralumin stamping, a chill die casting, a pressure die casting, or a hot stamping, according to the nature of the job.

Describing some of the production methods employed by the H. G. Hawker Engineering Co., Ltd., Mr. Sigrist showed slides of certain Hawker structural members. A typical fuselage joint was shown, in which use is made of a circular section tube on which flats are formed at the points where the fittings are to be placed. It was explained that the squaring or flattening operation on longerons and struts was carried out in a rolling machine. The operation could be by hand or power, and took a few minutes only. The diameter was important, but the length of the flats was immaterial. The flitch plates used in the joint were pressings, and from a range of six tools plates were available for machines between a light 'plane and a day bomber. The rivets were of steel tubing and could be to specification T.5 or the lower grades. Stainless rivets were available and spun quite easily. The cupped bolt which took the cross strut was a plain capstan job, and the wiring plates were pressed. Four tools would supply a very wide range of wiring plates, and should cover practically all requirements.

Slides were next shown of the new type of Hawker steel spar built up from sections formed from flat strip. The booms were rolled from strip in the hardened and tempered state, as was also the corrugated web. After the initial difficulties connected with roller shapes and number had been overcome, the job was simple, and the spar booms came from the machine quite straight, with no final operation being necessary to close it on to the web. Another type of spar, which has become known as the "double 8" was also shown, and the lecturer said that on small machines it was cheaper than the built-up spar, and had the advantage of being ready for use without manipulation on the part of the aircraft constructor.

The type of rib depended to some extent upon the spar. His firm had used ribs of duralumin tube, strip and aluminium sheet. The tubular rib was slightly lighter, but the material was costly. It was impossible to obtain tubular rivets in the smaller sizes, and with solid rivets care had to be taken as the thin gauge tubing was easily damaged. The strip rib was cheaper both as regards material and manipulation. The pressed aluminium rib was attractive, but had a limited application. If the quantity was sufficient to warrant a press tool this rib was cheaper. Purely as a personal opinion, Mr. Sigrist said, he preferred the wooden rib, and he saw no reason why it should not be used with metal spars. It was cheaper than any other type, and the combination should result in a very efficient unit.

The remainder of the technical sections of Mr. Sigrist's paper was devoted to a consideration of tanks, protection against corrosion, and plant.

TECHNICAL LITERATURE

SUMMARIES OF AERONAUTICAL RESEARCH COMMITTEE REPORTS

These Reports are published by His Majesty's Stationery Office, London, and may be purchased directly from H.M. Stationery Office at the following addresses: Adastral House, Kingsway, W.C. 2; 28, Abingdon Street, London, S.W.1; York Street, Manchester; 1, St. Andrew's Crescent, Cardiff; or 120, George Street, Edinburgh; or through any bookseller.

THE CHARACTERISTICS OF A KARMAN VORTEX STREET IN A CHANNEL OF FINITE BREADTH. By H. Glauert, M.A. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1151. (Ae. 317). December, 1927. (14 pages and 3 diagrams). Price 9*d*. net.

The theory of the drag due to the formation of a vortex street behind a body has been developed by Karman, and an attempt has now been made to extend the analysis to the case of a flow in a channel of finite breadth, but for simplicity the analysis is confined to the case when the breadth of the vortex street is not more than one-sixth of the breadth of the channel. The formula obtained for the drag of the body is similar to that given by Karman and involves two parameters which must be determined experimentally.

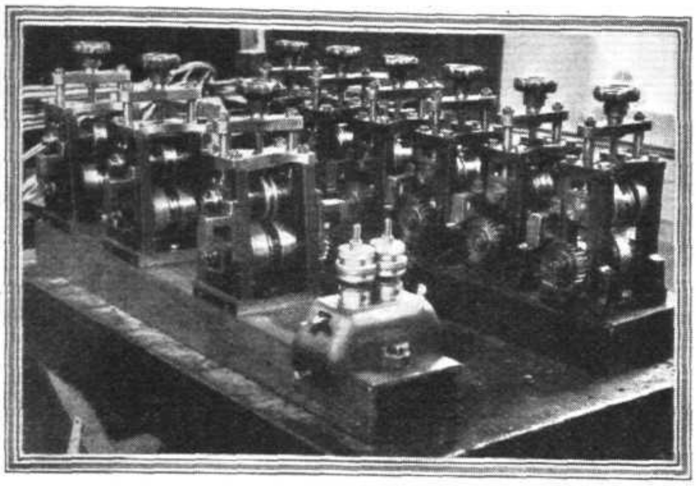
By means of certain assumptions, the analysis has been developed to a further stage, which makes it possible to predict the constraint of the channel walls in terms of the flow in an unlimited fluid. The final equations so obtained lead to values in good agreement with experimental results in the case of a flat plate, but it appears that the assumptions on which the analysis is based are valid for bodies of bluff form only and break down for bodies of elongated shape.

THE FORCE ACTING ON A BODY PLACED IN A CURVED AND CONVERGING STREAM OF FLUID. By Prof. G. I. Taylor, F.R.S. R. & M No. 1166. (Ae. 331). (10 pages and 1 diagram). April, 1928. Price 9*d*. net.

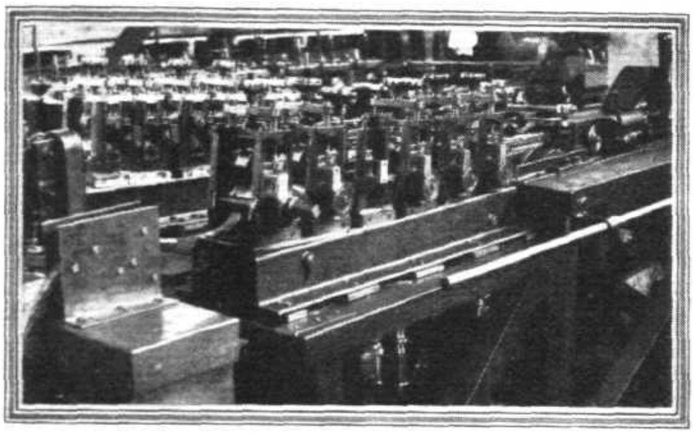
The conditions in a wind tunnel differ from those of flight in free air, and it is therefore necessary to make corrections in some wind tunnel tests before estimating the forces on the full-scale shapes. This is particularly the case for airship models, which are relatively long compared with the size of the tunnel in which they are tested, and over their length there is an appreciable drop in the pressure gradient down the wind.

The present paper shows, theoretically, how to make the appropriate corrections for this pressure drop (referred to as horizontal buoyancy) for the cases of a cylinder, of a sphere and of an ellipsoid when placed in a converging stream.

(*Continued from p.* 1086)



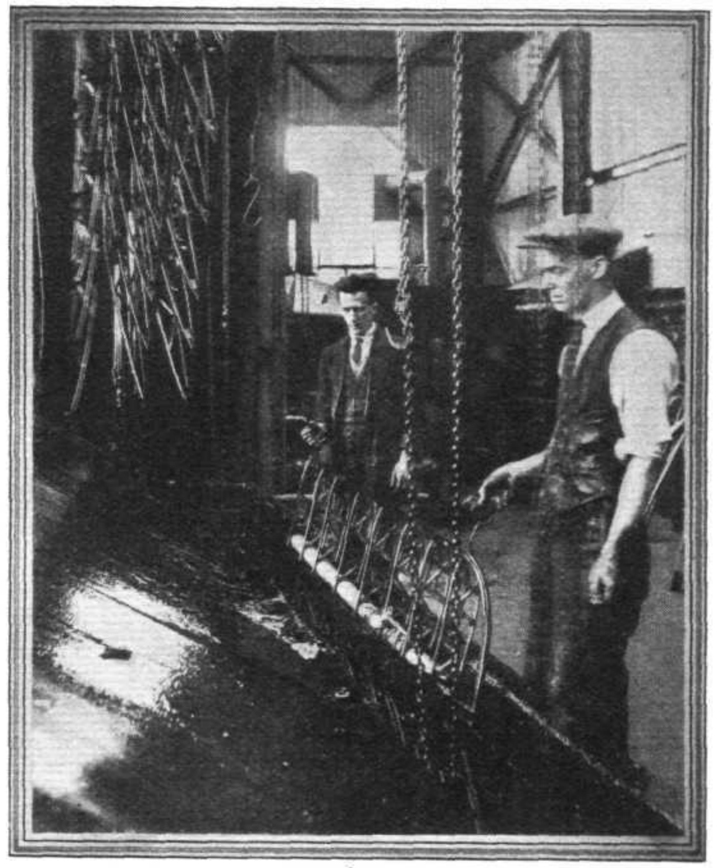
SEPARATE ROLLER UNITS: By mounting the rollers as a complete unit the best use can be made of the plant, as the roller units can be rapidly changed when a different section is to be produced.



DRAWBENCHES FOR MAKING STEEL SPARS FROM FLAT STRIP: Considerable use is being made of what is termed "draw-rolling," *i.e.*, the sections are formed by rollers, but the strip is pulled along by a chain as in drawing.

on page 1084, is exactly similar as regards its booms, but the web is quite narrow, and flat, *i.e.*, without corrugations.

The spar booms are built up each from three separate strips, the flanged edges of the strips forming angles of approximately 120°, and the three strips together forming a polygon. As this polygon is a regular one, a circular section tube can be made to fit snugly inside it, and this is actually done at points where fittings are to be attached, a short length of steel tube

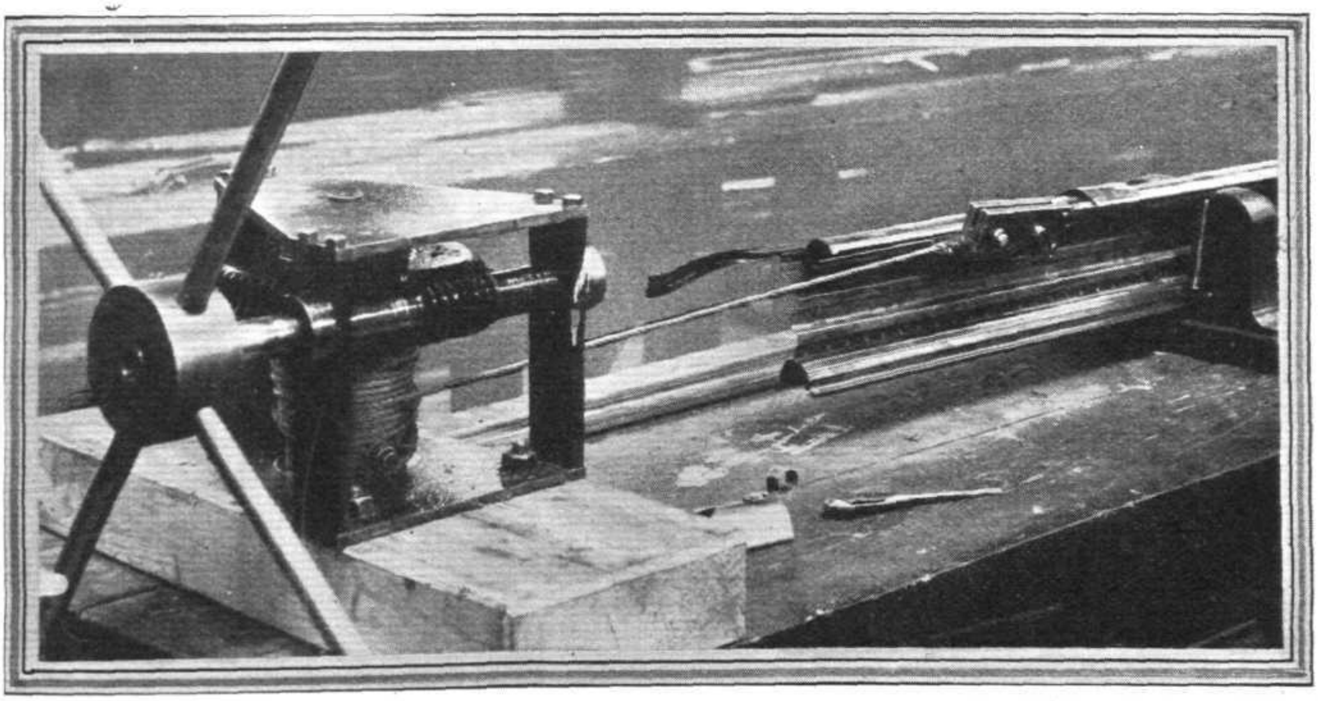


THE FINAL TREATMENT: Submerging a "Siskin" lower wing in the enamel bath preparatory to stoving.

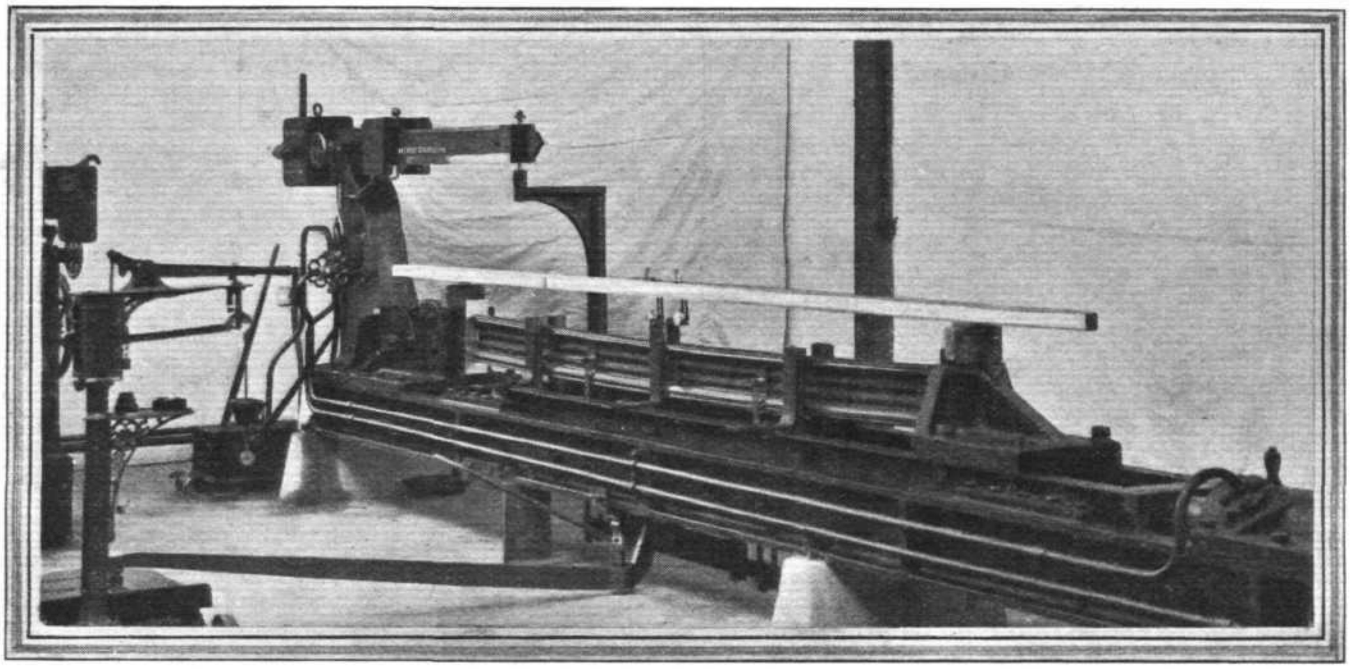
being inserted at the proper point before the final assembly of the spar.

Our sketches show also the U-section corner strips used in securing the spar boom strips together. When these corner strips have been pulled over the open flanges, the spar is finally completed by riveting through flanges and corner strips.

Certain spars in an aircraft such as aileron spars, are required to transmit torque. The normal main spar section is not suitable for this purpose, and a spar of special type is



ASSEMBLING STEEL SPARS: This machine is used for drawing the U-section corner strips over the flanges of adjoining sectors of steel spar booms. Flanges and corner strips are then riveted together.

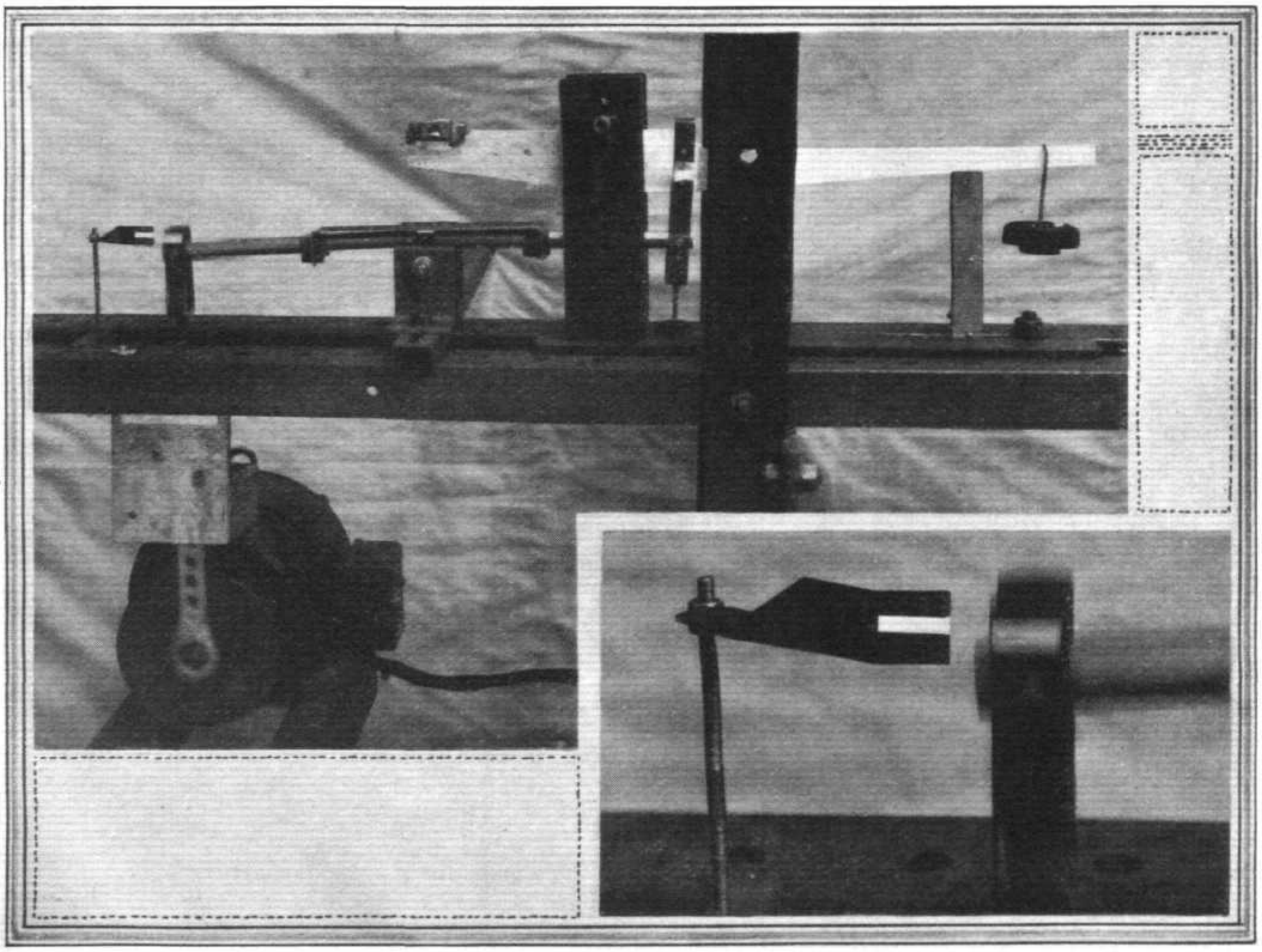


IN THE TESTING LABORATORY : A steel wing spar under test for combined bending and end load.

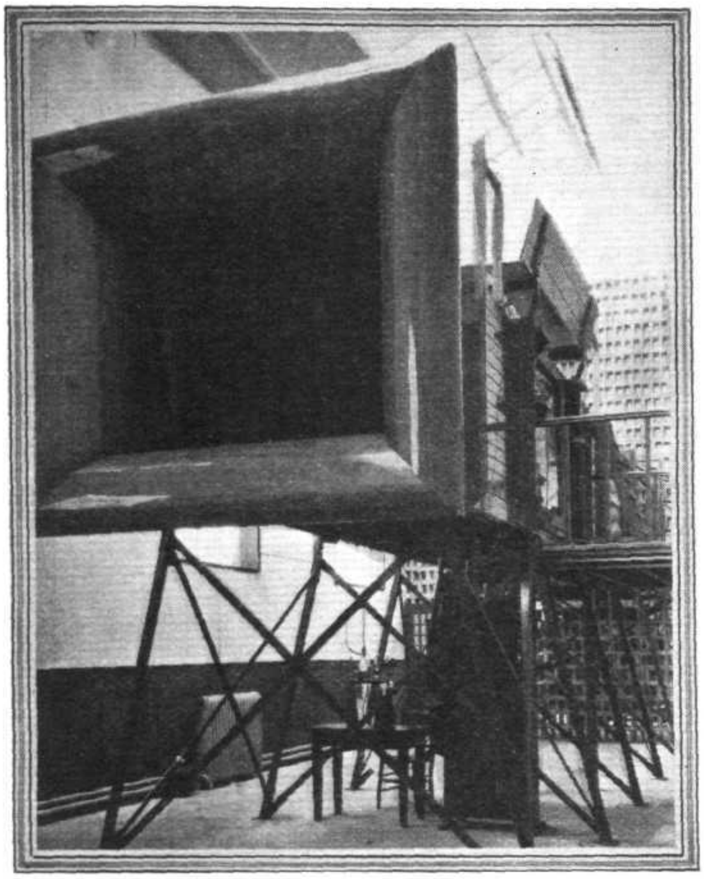
employed. This takes the form of a tube of polygonal cross section, but unlike the spar booms made up of four strips, as shown in Fig. 3, on page 1084. The same type of corner strip is used for securing the four strips together as in the case of the spar booms, but in place of the short lengths of solid-drawn tubes used as internal stiffeners in the spar booms, built-up circular stiffeners are used in the aileron torque tubes. These stiffeners are steel stampings, and their construction is shown in Fig. 4. Hinges, rib clips and strut sockets are shown in Fig. 3.

The various sections manufactured from steel strip are produced either by rolling or by drawing. Recently the Armstrong-Whitworth firm has introduced a process which has become known as draw-rolling. In this process the desired section is actually formed by passing the flat strip through a series of rollers, but the strip is pulled or drawn through the rollers by having its free end attached to a travelling chain as is done in drawing. It has been found that in this way it is easier to produce straight members.

Another innovation consists in mounting all the rollers



ANOTHER MACHINE IN THE TESTING LABORATORY : These two views show a piece of steel tube being tested in vibration. The white lines on the moving and stationary parts were painted in order to assist the photograph, and are not part of the test.



The Aerodynamic Side: A View of the new Wind Tunnel which has recently been installed at Whitley, and which is under the charge of Mr. Reynolds.

used in producing one particular section on a common baseplate or bed, so that the whole can be removed from the drawbench as a unit. Thus a change-over can be very quickly made when it becomes necessary to change from one section to another, and the drawbenches can be utilised to the best advantage. The strip, it should be pointed out, is rolled in the soft state and hardened and tempered after forming. The U-section corner strips are drawn over the free flanges by a hand-operated machine shown in one of our photographs. Metal clamps hold the strip down so that it cannot slide off the flanges, and when once in place the whole is held together firmly enough to permit of removing the spar and transferring it to the riveting bench where the final riveting-up is done.

The wing ribs have flanges of channel section, connected by bracing members of square section as shown in the sketches on p. 1086. After being formed by rolling the channel section flanges are bent to shape by hand on a special jig, as shown in one of our photographs. It might have been thought that it would be a matter of some difficulty to bend such a section "edgewise," but with experience it has been found possible to do so, provided care is taken to keep the flanges from buckling outwards during the bending process. This is accomplished by the operator sliding a sheet steel clamp along the rib at points where the buckling shows signs of taking place. Flanges and bracing members are all cut to length on jigs, and the rib is then assembled by girl labour on a wooden jig, as shown in a photograph. Joints are made by riveting. The details of leading and trailing edge attachments are shown by sketches, as are also the special toggles which secure the ribs to the spar boom flanges.

Heat Treatment and Rust Protection

It has been mentioned that the component parts are formed from flat strip in the soft state, and that heat treatment is done on the formed units. An unusual and very ingenious form of heat treatment has been evolved by the Armstrong-Whitworth staff. This consists in making the steel strip to be heat treated a resistance in an electrical circuit. As the current passes through it, the strip is heated and the fact that the process is an electric one enables the very closest control of temperature to be maintained. Actually it has been found that the temperature is not very critical, but even if it were, this electrical method would enable any desired temperature to be adhered to.

As with other forms of heat treatment, this leaves the strip with a scaled surface. This is cleaned off by hand, making use of wire brushes, and after final assembly the spars, ribs or complete wings are stove enamelled, two or more coats being given according to the degree of rust protection desired. One of our photographs shows a "Siskin" lower wing about to be dipped into the trough before being placed in the oven for stoving. During our visit to the Armstrong-Whitworth works we had an opportunity to examine some "Siskin" wings which had been in service for several years, and which had been returned to the works for re-covering. No trace of rust was to be found anywhere, and it would seem that the stove enamelling process employed is a very effective form of protection against corrosion. Fuselage members are treated in the same way, but in this case a side is dipped into the enamel, the fuselage being too large to be immersed as a complete unit. The struts of top and bottom bays are immersed also, and the final erection of the fuselage is carried out after enamelling.

Altogether it is obvious that metal construction as carried out at Whitley has been placed upon a real engineering production basis, and with the systems in force it should not be difficult, should the necessity arise, to go into real mass production in a comparatively short time. The forms of construction adopted have been chosen with this in view, and a happy compromise appears to have been found between reasonable cost of production on a peace time basis and adaptability to quantity production in case of emergency.

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Sir Hugh Trenchard to Retire

THE Air Ministry announces that Marshal of the Royal Air Force Sir Hugh Trenchard, Bart., G.C.B., D.S.O., having expressed the desire to be allowed to resign the appointment of Chief of the Air Staff when the interests of the Service permit, His Majesty the King was recently pleased, on the advice of the Secretary of State for Air, to accept his resignation, with effect from January 1, 1930.

African Air Lines

IMPERIAL AIRWAYS announce that a merger between themselves and the Cobham-Blackburn Air Lines, Ltd., has been arranged, to operate services in Africa. An Egypt-Cape Town line will be established in all probability.

London-Paris Night Service

THE French Air Union is starting a night air service between London and Paris in the new year. Both Croydon and Le Bourget are well equipped for night landings of aircraft, but the entire route between the two capitals is not lighted and pilots will have to rely upon navigation. Imperial Airways are not likely to commence a similar service under those conditions.

Blackpool Aerodrome

THE site chosen for the Blackpool Municipal Aerodrome, which was approved by Sir Sefton Brancker, is not to be utilised for the scheme, after all. At a recent meeting of the Aerodrome committee it was proposed to experiment with a smaller site at a cost of about £1,500. The abandoned site was expected to involve a cost of £30,000.

The Armstrong-Whitworth "Argosy" Airliners' Aggregate

THE three Armstrong-Whitworth "Argosy" airliners employed by Imperial Airways on the London-Continental air services have completed the following times, up to December 8 last: G-EBLO, 1,843 hrs. 37 mins.; G-EBLF, 1,585 hrs. 15 mins.; G-EBOZ, 1,433 hrs. 15 mins. This is equivalent to 165,925·5, 142,672·5, and 128,942·5 miles respectively.

The Aerial A.B.C.

No. 3 of the *Aerial A.B.C. and Commercial Air Line Gazetteer* (November, 1928—January, 1929) is to hand. This useful work not only contains particulars of all the passenger, mail, and freight air services operating throughout the world, but also gives much interesting information concerning air travel. There are maps showing the air routes of different countries, a gazetteer of towns served by air lines, and general items, such as rates of exchange, passports, societies and clubs, etc. The *Aerial A.B.C.* is published (quarterly) by the Aerial A.B.C., Ltd., 4, Duke Street, Adelphi, W.C.2, and is well worth the price charged—1*s*.

PRIVATE  FLYING

A Section of FLIGHT in the Interests of the Private Owner, Owner-Pilot, and Club Member

PRIVATE FLYING IN 1928

The following is a complete, up-to-date table of Private Owners of aircraft :—

Owners.	Machines.	Letters.	Registered.
G. H. Ambler	D.H. " Moth X "	G-AABI	9.11.28
L. J. Anderson	Avro " 504 K "	G-AACG	19.10.28
H. J. V. Ashworth	Avro "Avian III"	G-EBXJ	29.5.28
Lady Bailey	D.H. " Moth X "	G-AABN	14.9.28
,, ,,	D.H. " Moth "	G-EBSF	6.3.28
Capt. W. R. Bailey	D.H. " Moth X "	G-AADC	29.11.28
O. S. Baker	Supermarine " Solent "	G-AAAB	7.8.28
,, ,,	D.H. " Moth X "	G-AAAS	31.8.28
T. S. Baldwin	Avro " Avis "	G-EBKP	11.10.28
Capt. H. H. Balfour	D.H. " Moth X "	G-EBWX	10.3.28
Duchess of Bedford	D.H. " Moth X "	G-AAAO	11.10.28
A. G. H. Bond	Avro "Avian III"	G-EBWU	16.6.28
A. F. Burns	D.H. " Moth "	G-EBNY	3.12.28
G. F. Boyle	D.H. " Moth X "	G-AABH	11.9.28
Miss W. S. Brown	Avro "Avian III"	G-EBVZ	8.2.28
A. S. Butler	D.H. " Moth X "	G-AACL	7.11.28
,, ,,	D.H. " Moth X "	G-EBUX	12.5.28
R. A. Bruce	Westland " Widgeon III "	G-EBRL	11.5.27
R. J. Bunning	D.H. 6	G-EBWG	6.2.28
Capt. Stewart Burt	D.H. " Moth X "	G-EBTI	2.12.27
,, ,, ,,	D.H. " Moth X "	G-AADH	17.12.28
M. G. W. Burton	D.H. " Moth X "	G-EBRH	18.5.27
Capt. M. Campbell	D.H. " Moth X "	G-AAAJ	19.10.28
G. R. Carpenter	D.H. " Moth X "	G-EBZL	31.7.28
P/O. T. H. Carr	B.E. 2e	G-EANW	2.7.26
R. G. Cazalet	Westland " Widgeon III "	G-EBRM	7.9.27
J. W. P. Chalmers	D.H. " Moth X "	G-AACO	2.11.28
Flt.-Lt. N. Comper	C.L.A. 3	G-EBMC	30.7.25
R. P. Cooper	D.H. " Moth X "	G-AAAV	30.8.28
Hon. G. Cuncliffe	D.H. " Moth X "	G-AABO	14.9.28
Director of Surveys	Avro "Avian III"	G-AABZ	25.9.28
J. C. Don	Avro 504 K	G-EAJU	7.8.28
Capt. D. Drew	Fokker F.VIII	G-EBYI	30.5.28
Marquis of Douglas and Clydesdale	D.H. " Moth X "	G-EBSU	8.8.27
A. H. Downes-Shaw	D.H. " Moth X "	G-EBST	8.8.27
P. T. Eckersley	Avro "Avian III"	G-AABX	25.9.28
A. G. Fowler	D.H. " Moth "	G-EBMV	12.11.27
L. J. P. Fowler	D.H. " Moth X "	G-EBZH	9.7.28
T. A. Gladstone	Blackburn " Bluebird III "	G-EBWE	24.10.28
F. Gough	D.H. 53	G-EBRW	27.10.27
Rt. Hon. F. E. Guest	D.H. " Moth "	G-EBUV	3.10.27
,, ,,	D.H. " Moth X "	G-AABK	14.9.28
,, ,,	Junkers F. 13	G-EBZV	12.7.28
Capt. S. S. Halse	D.H. " Moth X "	G-EBYS	23.7.28
H. E. Hamer	" Monocoupé "	G-AADG	6.12.28
,, ,,	D.H. " Moth "	G-EBUW	3.10.27
Capt. G. de Havilland	D.H. " Moth X "	G-AAAA	30.7.28
,, ,, ,,	D.H. " Moth "	G-EBPU	6.3.28
W. Hay	S.E.5A	G-EBTO	17.8.27
Capt. E. Hayes	Avro "Avian III"	G-EBYA	12.7.28
Lady M. Heath	D.H. " Moth X "	G-EBZC	3.7.28
Sqdn.-Ldr. B. Hinkler	Avro " Avian "	G-EBOV	7.4.27
P. W. Hoare	D.H. " Moth X "	G-EBZY	28.7.28
H. Hollindrake	Avro " Avian "	G-EBTP	17.8.27
A. P. Holt	Fokker F. VIII	G-EBZJ	4.7.28
Lord Invernairn	Beardmore "Wee Bee"	G-EBJJ	4.7.28
J. D. Irving	D.H. " Moth X "	G-AADA	28.11.28
A. C. M. Jackaman	D.H. " Moth X "	G-EBRT	31.5.27
R. H. Jackson	Avro " 504 K "	G-EBYE	2.11.28
N. H. Jones	D.H. " Moth X "	G-EBWI	15.2.28
H. Kennedy	B. & P. " P9 "	G-EBEQ	13.12.27
E. R. King	Austin "Whippet"	G-EAPF	2.5.28
R. W. H. Knight	D.H.53	G-EBRK	15.10.28
H. R. Law	D.H. " Moth X "	G-EBYJ	15.10.28
Miss C. R. Leathart	Sopwith " Grasshopper "	G-EAIN	24.2.28
H. H. Leech	Avro " Baby "	G-EAUM	6.9.28
G. Linnell	D.H. " Moth X "	G-EBSA	21.7.27
D. J. Hamilton-Lister	Avro "Avian III"	G-EBVA	26.10.28
Capt. J. S. Lord	Avro 548	G-EAFH	17.2.28
G. A. R. Malcolm	D.H. " Moth X "	G-AAAI	30.8.28
J. L. May	Avro " 504 K "	G-AACA	28.9.28
I. McClure	D.H. " Moth X "	G-EBUR	18.10.27
G. Merton	D.H. " Moth "	G-EBQZ	31.5.27
L. J. C. Mitchell	Westland " Wood Pigeon II "	G-EBJV	31.10.27
Sir Pyers G. J. Mostyn	D.H. " Moth X "	G-AABJ	14.9.28
K. G. Murray	D.H. " Moth X "	G-EBWA	11.5.28
H. Murray-Philipson	D.H. " Moth X "	G-EBWD	2.3.28
Maj. A. A. Nathan	D.H. " Moth X "	G-EBYV	23.6.28
C. S. Napier	Westland " Widgeon III "	G-AADE	3.12.28
Nigel Norman	D.H. " Moth X "	G-EBWY	10.3.28
L. R. Oldmeadows	S.E.5a	G-EBTK	9.8.27
J. S. Oliver	D.H. " Moth X "	G-EBZG	6.7.28
Lord Ossulston	D.H. " Moth X "	G-EBWL	2.3.28
E. Percival	Avro "Avian III"	G-EBYR	12.7.28
H. Petre	D.H. " Moth X "	G-EBWZ	13.3.28
Sqdn. Ldr. H. M. Probyn	Westland " Widgeon III "	G-EBRQ	11.7.27
Capt. R. S. Rattray	D.H. " Moth X "	G-EBZZ	1.8.28
E. K. Rayson	Avro "Avian III"	G-EBWR	26.10.28
Dr. Whitehead Reid	Westland " Widgeon II "	G-EBJT	5.1.28
L. G. Richardson	D.H. " Moth "	G-EBPQ	3.5.27
T. Richardson	Avro 548	G-EAAL	25.5.26
J. D. Roberts	D.H. " Moth X "	G.-EBZO	14.7.28
J. J. Scott Robertson	Avro 548	G-EBPO	23.11.27
W. L. Runciman	D.H. " Moth X "	G-EBWT	27.11.28
R. F. Scarlett	D.H. " Moth X "	G-AAAE	31.8.28
F./O. A. F. Scroggs	D.H. 53	G-EBQP	5.1.28
,, ,,	Westland "Wood Pigeon "	G-EBIY	12.5.27
O. E. Simmonds	Simmonds " Spartan "	G-EBYU	23.6.28
A. Smith	English Electric " Wren "	G-EBNV	9.4.26
Sqdn.-Ldr. F. O. Soden	D.H. " Moth X "	G-EBOU	8.12.27
Miss W. E. Spooner	D.H. " Moth X "	G-AAAL	30.8.28
D. F. Tennant	D.H. " Moth X "	G-EBZP	14.7.28
E. H. Thierry	D.H. " Moth X "	G-EBZI	6.7.28
J. H. Thompson	D.H. " Moth X "	G-AAAC	10.8.28
R. N. Thompson	D.H. " Moth X "	G-AACZ	29.11.28
R. Trafford	D.H. " Moth X "	G-AADD	6.11.28
K. Twemlow	D.H. " Moth "	E-EBLV	23.7.28
A. F. Wallace	D.H. " Moth X "	G-EBPM	6.3.28
D. A. N. Watt	S.E.5a	G-EBOG	5.6.26
Air Comdr. J. Weir	Autogiro C.8.L	G-EBYY	21.6.28
F/O. A. H. Wheeler	S.E.5a	G-EBQM	22.3.27
D. L. H. Williams	Sopwith " Dove "	G-EBKY	27.3.25
P. A. Wills	D.H. " Moth "	G-EBPS	23.11.28
G. A. Worth	D.H. " Moth X "	G-AAAD	15.8.28
T. H. Worth	D.H. " Moth X "	G-EBSP	6.8.27
Flt.-Lt. A. M. Wray	Bristol " Scout "	G-EAGR	20.6.27
K. V. Wright	D.H.53	G-EBXM	19.4.28
F. Winn	Supermarine " Seagull "	G-EBXH	3.4.28
Sqdn. Ldr. C. S. Wynne-Eyton	D.H. " Moth X "	G-EBVJ	16.1.28
H. M. Yeatman	D.H. " Moth "	G-EBVD	25.6.28

The present total of private owners, namely, 111, may not indicate private flying on a scale anticipated after another year, but we believe that it is a branch of flying which no other country adopts to the same extent. Competition might be expected of America, for example, but Lady Heath informs us in a recent letter from New York that there is little private flying there as we practise it. There is, we believe, more individual ownership of aircraft, but almost entirely for commercial purposes. "Barnstorming," or joy-riding, as we term it, is widely followed as a living by pilot owners. Col. Lindbergh was a "barnstormer" before his Atlantic flight, as he tells us in his book "We, Pilot and Plane."

We observe that ownership amongst our lady pilots does not increase, and the present number, five, seems extraordinarily small. In fact, the general increase in ownership seems sluggish, and as the subsidised and unsubsidised flying clubs have increased rather than dwindled and turned out more pilots, it appears as though everyone is waiting for that cheap light 'plane.

We have always noted with satisfaction that the owners who formed the small original class rarely if ever, drop out, but we see from the above table that two of them, namely, Sir John Rhodes and Mr. David Kittel, are no longer there. Both owned and flew D.H. "Moths" for a few years, until some time ago, and we cannot but believe that their status as private owner-pilots is merely in abeyance. Miss Sicele O'Brien, too, disappears from the table on this occasion after a long membership. We are glad to say that she is recovering from the accident which wiped off her D.H. "Moth" "OS," and is anxious to fly again. Unfortunately, the insurance on her machine had run out a few days before the crash, so that her loss was complete.

Mr. H. E. Hamer, of the Irvin Air Chute Co., has brought over an American "Monocoupe,", though not to replace his D.H. "Moth," which he has flown for a considerable time.

LIGHT 'PLANE CLUBS

London Aeroplane Club, Stag Lane, Edgware. Sec., H. E. Perrin, 3, Clifford Street, London, W.1.
Bristol and Wessex Aeroplane Club, Filton, Gloucester. Secretary, Major G. S. Cooper, Filton Aerodrome, Patchway.
Cinque Ports Flying Club, Lympne, Hythe. Hon. Secretary, R. Dallas Brett, 114, High Street, Hythe, Kent.
Hampshire Aero Club, Hamble, Southampton. Secretary, H. J. Harrington, Hamble, Southampton.
Lancashire Aero Club, Woodford, Lancs. Secretary, F.W. Atherton, Woodford Aerodrome, Cheshire.
Liverpool and District Aero Club, Hooton, Cheshire. Hon. Secretary, Capt. Ellis, Hooton Aerodrome.
Midland Aero Club, Castle Bromwich, Birmingham. Secretary, Major Gilbert Dennison, 22, Villa Road, Handsworth, Birmingham.
Newcastle-on-Tyne Aero Club, Cramlington, Northumberland. Secretary, J. T. Dodds, Cramlington Aerodrome, Northumberland.
Norfolk and Norwich Aero Club, Mousehold, Norwich. Secretary, G. McEwen, The Aerodrome, Mousehold, Norwich.
Nottingham Aero Club, Hucknall, Nottingham. Hon. Secretary, Cecil R. Sands, A.C.A., Imperial Buildings, Victoria St., Nottingham.
The Scottish Flying Club, 101, St. Vincent Street, Glasgow. Secretary, Harry W. Smith.
Southern Aero Club, Shoreham, Sussex. Secretary, C. A. Boucher, Shoreham Aerodrome, Sussex.
Suffolk Aeroplane Club, Ipswich. Secretary, Maj. P. L. Holmes, The Aerodrome, Hadleigh, Suffolk.
Yorkshire Aeroplane Club, Sherburn-in-Elmet, Yorks. Secretary, Lieut.-Col. Walker, The Aerodrome, Sherburn-in-Elmet.

LIVERPOOL & DISTRICT AERO CLUB

REPORT for week ending December 15:—Instructor: Flight- eut. Sullock Ground Engineer: Mr. B. R. Nutter. Machines in commission: Avro "Avians" WK and XY.

Total flying time, 7 hours. Ten pupils flew 3 hrs. 50 mins. dual; four soloists totalled 45 mins; seven "A" Pilots totalled 1 hr 40 mins; two passenger flights totalled 25 mins. Four test flights totalled 20 mins.

Mr. Sullock has very kindly "rallied round" at the week-ends, both Mr. Allen and Pixton being away on sick leave.

Mr. T. H. Naylor completed his tests for R.Ae.C. certificate this week in a very satisfactory manner. Mrs. Naylor took her ticket a few weeks ago, thus Mr. and Mrs. Naylor are the first married couple in this club (and the north of England ?) to become certified pilots.

Flying will take place on Saturday afternoon and Sunday, and the club will re-open for "business as usual" on the 27th. On the evening of the 27th, we hope to hold an informal "Punch party" in the Clubhouse—Salve!

MIDLAND AERO CLUB

REPORT for week ending December 12.—The total flying time was 9 hrs. 25 mins. Dual, 2 hrs. 5 mins.; solo, 4 hrs. 35 mins.; passenger, 1 hr. 50 mins.; test, 55 mins.

The following members were given dual instruction by Flight-Lieut. T. Rose, D.F.C., and Mr. W. N. Sutcliffe:—M. Blakeway, T. W. Wild, M. C. Wilks, C. W. R. Gleeson, W. L. Handley.

"A" Pilots:—N. L. Jackson, E. P. Lane, H. Lattey, H. J. Willis, R. L. Brinton, G. V. Perry, W. M. Morris, R. D. Bednell, E. R. King, S. Duckitt, R. C. Baxter, J. Rowley.

Soloists:—W. L. Handley, M. Blakeway, C. W. R. Gleeson, J. K. Morton.

Passengers:—L. V. Mann, S. Buckle, N. A. Carr, E. Hanson, Miss Toppin.

Owing to bad weather, flying was only possible on two days.

Christmas Holidays:—The Club will be closed down from December 24 to 28 inclusive.

NEWCASTLE-UPON-TYNE AERO CLUB

REPORT for week ending December 16:—Pilot Instructor: G. M. S. Kemp. Ground Engineer: K. C. Brown; Asst.: J. Tait. Machines: (1) G-EBLX. Flying time for week: 8 hrs. 25 mins. Instruction (4), 5 hrs. 25 mins.; "A" pilots (2), 45 mins.; solo training (2), 2 hrs.; tests, 15 mins.

We are pleased to report that flying recommenced on Wednesday, the 12th inst., this being the first since our machines were damaged during the gale in November. On Thursday, Mr. Stainthorpe was launched and on Saturday Mr. Tomkins successfully mastered his first solo. These two members are Mr. Kemp's first soloists since joining the club. The repairs to the damaged hangar are nearing completion while alongside are being erected two small hangars for private owners. Mr. Runciman, our latest private owner, has been giving us some demonstrations of the use of slots on his Moth, "WT."

Messrs. R. N. Thompson and J. D. Irving are taking delivery of their new "Gipsy Moths" this week, and we hope they will be favoured with a fine day in order to fly the machines to Cramlington.

NOTTINGHAM AERO CLUB

REPORT for week ending December 7.—Pilot instructor: Mr. Bernard Martin. Ground engineer: Mr. F. H. Harley. Machines: G-EBQW, G-AABA. Flying time: for week 17 hrs. 35 mins. Pupils under instruction: (Dr. Tresidder and Messrs. Granger W. Kay, Cudlip, R. Hood and Hutchinson), 9 hrs. 20 mins. Soloists under instruction (Mr. R. Hood): 15 mins. "A" pilots (Lord Douglas Hamilton and Messrs. Cox, Wynn, Winn, Selvey, Taylor, Whitly and Shipside), 6 hrs. 35 mins. Passengers carried (2), 25 mins. Test flights (8), 1 hr.

There is very little news this week as the wireless has ceased to function and the weather has managed to behave itself a little during the week-end. Mr. (Texas) Austin is to be congratulated on completing his tests for his "A" ticket. We have only one machine in action at the moment, as QW's engine cut up rough and is now being de-coked, etc. Where is that spare engine? Dr. Tresidder, who is 55 by the way, is making excellent progress and before long we hope to see him handling his own Moth. W. Granger is due for solo any day now. Foreign papers please copy.

SOUTHERN AERO CLUB

REPORT for week ending December 16.—At the end of the week we had the dual Avro, G-EBYB back on service again, with top planes intact, after her damage suffered a fortnight ago in the gales. On Sunday, we managed to get in some flying, despite the high wind and bad weather generally. This is where we score over clubs using light aeroplanes, for an Avro 504K can be safely flown in quite rough weather, and consequently the pilots we turn out are "all-weather" pilots.

Mr. Bellairs, one of out members, has just bought a new Avian, G-AADF. He and Mr. Miles flew it back to Shoreham from Manchester on Thursday.

The buffet and luncheon bar continues to be well patronised, and is proving a most acceptable innovation.

SUFFOLK AEROPLANE CLUB

REPORT for week ending December 15:—Instructor: G. E. Lowdell, A.F.M. Ground Engineers: "A and C" Mr. W. L. Garner; "A" Mr. G. Keeley. Three Blackburn "Bluebirds," RE, SZ and UH.

Flying time: 14 hrs. 25 mins. Nine members had dual instruction (7 hrs. 10 mins.); three members flew solo under instruction (4 hrs. 10 mins.). Flights were made by one "A" licence member (25 mins.); four passengers were carried (25 mins.; two passengers were carried and two trips made on the Ipswich-Cambridge Airway (1 hr. 45 mins.); five tests were made (25 mins.)

Mr. Welsh completed tests for "A" licence, and Mr. Collingwood completed his height test.

During the absence of Mr. Mayhew on the sick list, Mr. Garner, who has just returned from the Middle East service of Imperial Airways and is learning to fly with us, kindly acted as ground engineer in charge of engines.

The club will be closed for the holidays from Sunday night, December 23, to Tuesday morning, January 1.

Cambridge Aeroplane Club.—The weather permitted instruction at Conington on one day during the period and Cambridge members were given dual instruction. It is hoped that by the spring the membership of this branch will justify at least one machine and one instructor being stationed at Conington permanently. Potential members are reminded that after January 1 the entrance fee of £3 3s. which has been waived up to the present, will come into force as at Hadleigh. They are, therefore, advised to join up without delay.

The Marine Aero Club.—Steady progress is being made in the formation of this branch. Preliminary arrangements have been made with a firm of boatbuilders at Brightlingsea to provide the necessary facilities for light seaplanes. Mr. Lancaster Parker has promised to bring over the Short "Mussel," possibly in January, for the purpose of giving a demonstration to members and others interested in light seaplanes. It is hoped to arrange for this to take place during the week-end. Definite details will be published later, and it is hoped that all interested will attend. All seaplane members who have not already obtained an "A" Licence will be required to do so on the Club's aeroplanes at Hadleigh or Conington. Thus those who desire to fly to Brightlingsea during the summer are advised to join soon in order to be qualified when seaplane flying starts. We should like to hear from all who are interested in the Marine Aero Club if they will write to Hadleigh Aerodrome

YORKSHIRE AEROPLANE CLUB

REPORT for week ending December 15.—Pilot instructor: G. R. Beck. Ground engineer: R. Morris. Machines in commission (3): TB, SV, RF. Flying time: 10 hrs. 10 mins. Instruction: (5) 2 hrs. 20 mins. Soloists (2): 40 mins. "A" pilots (7): 6 hrs. 55 mins. Passengers (1): 15 mins.

The Club will be closed from December 20 to January 7 inclusive for Christmas and the annual staff holiday.

AIRISMS FROM THE FOUR WINDS

Flight-Lieut. R. Bentley's Flight

On December 19, 1928, Flight-Lieut. R. R. Bentley and his wife reached Salisbury, Rhodesia, in his Cirrus-Moth, on their return to South Africa after their long sojourn in England for their honeymoon. He has now completed his flight, having arrived at Pretoria on December 22 last. To the A.D.C. Aircraft Co. he cabled as follows: "Landed today, congratulate you on my Cirrus mark three being first engine in 85/95 horse power class to complete African flight without trouble. Bentley." This is the third flight made by him between South Africa and London, and with the same A.D.C. "Cirrus" engine, though it was converted to a Mark III for the last flight.

Lady Bailey's Flight

After some delay at Gao on the Niger waiting for permission to cross the Sahara, which was refused, Lady Bailey reached Mopti, higher up the river Niger, on the next stage, and then flew to Port Etienne about December 21 last. On December 23 she reached Rio de Oro, Spanish Sahara. She is flying a Cirrus-Moth.

New Atlantic Flight via Greenland Proposed

Mr. B. Hassell and Mr. Cramer, who were missing for some time in August last in Greenland during an attempted flight from America to Sweden, will make another attempt about June next year in a three-engined seaplane. The complete course from Rockford, Illinois, is *via* Greenland, Stockholm, Copenhagen and back to the United States.

London-Accra Flight

Capt. R. S. Rattray, a Provincial Commissioner on the Gold Coast, who is flying from England to Accra to resume his official duties, reached Mogador on December 26 in his Cirrus-Moth. He met Lady Bailey there, who is flying back to England.

R.A.F. Operations in Afghanistan

On December 19 a R.A.F. machine, flown by Flying-Officer C. W. L. Thirsk and L.A.C. Donaldson, was hit by rebel gunfire whilst flying over the British Legation at Kabul in Afghanistan to observe if it was safe from the rebellion that has broken out owing to the enforcement of western ideas by King Amanullah. It landed safely on the Sherpur aerodrome outside Kabul, and the airmen are safe. A Vickers "Victoria," piloted by Sqdr.-Ldr. Maxwell and Pilot Officer Beasley, reached Kabul on December 24 and took off Lady Humphreys, wife of Sir Francis Humphreys, British Minister in Afghanistan, Mrs. Gould, wife of the Counsellor of the Legation, and many others, and flew them safely a distance of 160 miles in 105 minutes to Peshawar. Other R.A.F. machines also rescued women and children from the French and German communities in Kabul. On that day 20 British and Indian women and children, and 37 of other nationalities, were rescued altogether by the Royal Air Force. Wintry weather is now likely to create a lull in the rebellion. The country between Kabul and Peshawar is very mountainous, and offers practically no place for safe forced landings, and it is inhabited by tribes.

New Belgium Aerodromes

The Belgian Air Ministry has decided to establish an emergency aerodrome at Casteau-le-Mons military camp, which is on the Paris-Brussels air route.

Portuguese Flight Ended

The Portuguese airmen who flew from Lisbon to Lourenco Marques, Capts. Veigas and Pais de Ramos with mechanics, are returning to Lisbon by boat with the machines, Vickers "Valparaiso's" (Napier "Lion") as cargo. In the various places touched at by the airmen the Portuguese communities subscribed liberally towards expenses of the flight.

Endurance Record to be Attempted

A Fokker monoplane named *Question Mark* has been prepared for a record endurance flight at Midland, Texas. The machine will be refuelled in flight. Whilst flying over Western Alabama on test oil as well as petrol was taken in from another machine.

Air Matters with Belgium

Air Vice-Marshal Sir Sefton Brancker, Sir Alan Cobham and Maj. Woods-Humphrey, Manager of Imperial Airways, reached Brussels on December 20 last to discuss the question of air relationship between Great Britain and Belgium, and also aviation in the Congo with M. Lippens, the Belgium Minister of Aviation. They were received by King Albert on December 21, 1928, by the Aero Club de Belgique. Sir Alan Cobham was presented with the diploma of honorary member.

German Entry for Schneider Trophy?

A Berlin report states that Germany may enter for the next Schneider Trophy race if the Government or the public assist the Dornier Company with funds to construct a machine, the drawings of which are apparently prepared.

Antarctic Flight Discovery

Sir Hubert Wilkins, the explorer, made a survey flight from his base at Deception Island recently, and discovered that Graham Land was an island and not part of the Antarctic mainland. A message of congratulation was sent to him from Comdr. R. Byrd, who is to carry out air exploration from the opposite side of the Antarctic. Sir Hubert Wilkins is using Lockheed "Vega" monoplanes, the same type in which he flew across the North Pole with Lieut. Carl Eielson.

East African Flying Clubs

There is growing interest in aviation in East Africa, and it is anticipated that flying clubs will be formed in time at such places as Kenya, Uganda, Tanganyika and Zanzibar. There is already an Aero Club of East Africa affiliated to the Royal Aero Club of the United Kingdom. Sir Charles Wakefield has kindly consented to become a Vice-Patron. The official organ of the Club is *Aeroken*.

Kenya Aviation

British East African Airways, Ltd., have been floated in Kenya Colony with registered offices at Nairobi. Lord Delamere is Chairman, and the directors include Com. Mansfield Robinson and Mr. John Carberry. The policy of the company is to develop civil aviation, for which the conditions are extremely favourable. The agent for the company is Mr. Graham Dawson.

Commercial Aviation in Canada

A regular air mail service between Montreal and Vancouver, speeding up delivery by 24 hours, will be established soon if success attends an experiment carried out by the postal authorities during December. This is on the authority of Victor Gardet, postmaster at Montreal, who told the Chamber of Commerce there that such a project was intended by the Postmaster-General. It is intended to make Lethbridge the southern terminal of an inter-city air line connecting Lethbridge, Calgary and Edmonton, linking up the city with the east-west air mails from Winnipeg to Calgary and Edmonton, and perhaps eventually extending to connect up with the Great Falls–Salt Lake City air mail across the border. In preparation for this the Great Western Airways (Lethbridge) has been formed.

Air Transport in India

Flying Officer J. S. Newall left Karachi, in a D.H.9a recently and flew to Bombay in 8 hours, the distance being 640 miles. One landing was made on the way at lunch-time, near Mervi. He and Flying Officer Vincent left England early this year on a Far East flight to discover possible air transport routes in each country they passed through. Both have now been in India for seven months. It is stated that they have enlisted the support of many Bombay business men, and no doubt F/O. Newell's flight was the beginning of a new service between Karachi and Bombay.

Seasonal Greetings

The Editor of Flight tenders his sincere thanks for the numerous Christmas and New Year greetings which have been sent from near and far. He reciprocates with good wishes and earnestly hopes that 1929 will be a prosperous and Happy New Year for everyone.

THE ROYAL AIR FORCE

London Gazette, December 18, 1928.

General Duties Branch

Air Commodore Felton V. Holt, C.M.G., D.S.O., is appointed Director of Technical Development, Air Ministry (Dec. 7) (vice Air Commodore John A. Chamier, C.B., C.M.G., D.S.O., O.B.E.)

The follg. Pilot Officers are promoted to rank of Flying Officer:—G. F. Simond (Oct. 9); I. McL. Cameron (Nov. 2): J. H. Lindell (Nov. 2).

The follg. are placed on retired list at their own request:—Wing Commander D. S. K. Crosbie, O.B.E. (Dec. 8); Squadron Leader C. A. Ridley, D.S.O., M.C. (Dec. 19). Flying Officer A. G. Hill is transferred to Reserve, Class A. (Dec. 13). The follg. Flying Officers resign their permanent commn. (Dec. 11):—N. Vintcent, D.F.C.; J. S. Newall.

Pilot Officer L. H. Smith relinquishes his short services commn. on account of ill-health (Dec. 14). The short service commn. of the follg. Pilot Officers on probation are terminated on cessation of duty:—P. C. Wilkin (Dec. 14); J. F. Ballin (Dec. 19). Capt. E. J. O. Ellison, R.M., Flying Officer, R.A.F., relinquishes his temp. commn. in R.A.F. on return to duty with the Royal Marines (Dec. 6).

Medical Branch

Flight Lt. J. C. Osburne, M.B., is promoted to rank of Sqd. Leader (Dec. 19).

Memorandum

176360 Flight Cadet C. Noble is granted an hon. commn. as Sec. Lt., with effect from date of his demobilisation.

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Flight Lieutenants: H. D. O'Neill, A.F.C., to No. 1 Indian Group, H.Q., India, 1.11.28. E. W. Broadberry, M.C., to No. 1 Sqdn., Tangmere, 12.12.28. G. N. P. Stringer to No. 101 Sqdn., Bircham Newton, 5.1.29. G. E. Gibbs, M.C., to R.A.F. Cadet College, Cranwell, 19.12.28. R. Pyne, D.F.C., to No. 3 Flying Training Sch., Grantham, 19.12.28. C. L. Falconer, to No. 2 Flying Training Sch., Digby, 19.12.28.

Flying Officers: F. W. Foster, D.F.C., D.S.M., to No. 2 (Indian Wing) Station, India, 1.11.28. W. H. Burbury to Aircraft Park, India, 25.10.28. T. E. Worsley to No. 60 Squadron, India, 1.11.28. (Hon. F/L.) F. L. Woledge to R.A.F. Depot, Uxbridge, 1.12.28. R. G. Hart, M.C., to R.A.F. Depot Uxbridge, 19.11.28. A. B. Smith, M.C., to Aircraft Depot, India, 9.11.28. A. T. S. Studdert to No. 10 Sqdn., Upper Heyford, 6.1.29. G. R. Beamish and A. W. Shaw, to No. 3 Flying Training Sch., Grantham, 19.12.28. L. C. Barling to No. 1 Flying Training Sch., Netheravon, 19.12.28. S. H. V. Harris and G. H. Shaw, to R.A.F. Cadet College, Cranwell, 19.12.28. G. W. Tuttle to No. 605 Sqdn., Castle Bromwich, 19.12.28. P. R. Barwell, to No. 602 Sqdn., Renfrew, 19.12.28. T. G. Pike and M. Griffiths to No. 5 Flying Training Sch., Sealand, 19.12.28. A. R. Leslie-Melville to R.A.F. Training Base, Leuchars, 19.12.28. J. H. Edwardes Jones to R.A.F. Station, Duxford, 19.12.28. D. N. Roberts to No. 2 Flying Training Sch., Digby, 19.12.28.

CRANWELL CADETS

Marshal of the Air Force Sir Hugh Trenchard was present at Cranwell at the passing-out inspection of cadets on December 14. Air Vice-Marshal F. C. Halahan read the report on the work of the last term, of which the following is a *résumé*:—

Strength.—The total strength of the Cadet College is 103, of whom 21 are due to pass out this term.

Flying Training.—The cadets have carried out more instructional flying during 1928 than in any previous year, and the cadets now due to pass out have averaged 83 hours' flying, of which 24 hours have been solo on Service types.

Educational Training.—In aeronautical engineering the work of the cadets of the Fourth Term has reached a high standard. The ability, keenness and industry of this senior term has been exceptional.

In aeronautical science the standard of knowledge possessed by the First and Second Terms on entry was very low, and they should realise that the grounding they can obtain at the Cadet College should be the basis of a continuous study throughout each individual's career.

In English Literature and History the term passing-out has utilised the Library well, whilst the standard of criticism and self-expression in the Second and Third Terms is encouraging. The progress of the Iraqi Cadets is very satisfactory.

W/T. and Morse.—Cadets must realise the high importance of wireless in the Royal Air Force, and there is still room for further improvement in their standard of knowledge.

Armament.—Flight Cadets have shown exceptional keenness in armament subjects, and the Fourth Term have shown a very high standard, both in theory and practice, throughout their course.

Air Pilotage.—The cadets have displayed much keenness in their practical air pilotage instruction, and although bad weather at the latter half of the current term has interfered considerably with it, the Third and Fourth Terms have had 34 hours' practice.

Meteorology.—Close co-operation has been maintained between the Meteorological Office and the officers in charge of practical flying training, with the result that the maximum possible use has been made of the periods in which favourable conditions prevailed.

Discipline.—The discipline of the College has been exceptionally good, and the Under-Officers and Non-Commissioned Officers have performed their duties in a very satisfactory manner.

Health.—The health of the cadets has been excellent, and admissions to hospital have been chiefly caused by accidents in organised games. Eight admissions were due to motor-cycle accidents.

Physical Training and Games: (*a*) *Physical Training.*—The standard of physical training is good, especially in the Senior Terms. There is, however, room for improvement among the First Term.

(*b*) *Skill-at-Arms.*—The Cadets have taken part in two matches this season, the results of which are exceptionally good. Cambridge was beaten by 15 victories to 12, and the London Rifle Brigade by 30 victories to 22.

(*c*) *Rugby Football.*—The outstanding performance of the season has been the winning of the matches against Sandhurst and Woolwich, the former by 13 points to 8 points, and the latter by 24 points to 15 points.

(*d*) *Association Football.*—Little success was gained until about a fortnight before the match with Woolwich, which resulted in a win for the College by 2 goals to 1.

(*e*) *Beagles.*—The pack now consists of 17 couple, and hunting in the early morning was commenced on September 5, and has continued regularly since.

Good sport has been shown and four and a-half brace of hares have been killed up to date.

I wish to place on record my appreciation of the able manner in which officer, civilian professors and lecturers, and non-commissioned officer instructors have assisted me in carrying out the syllabus of instruction as laid down by the Air Ministry.

Awards.—The Sword of Honour, presented to the best all-round Flight Cadet in the Senior Term has been awarded to: Flt./Cadet Under Officer Charles, G. P.

The R.M. Groves' Memorial Prize, for the best all-round Pilot in the Senior Term has been awarded to Flt./Cadet Corporal Lascelles, D. P.

The Abdy Gerrard Fellowes Memorial Prize for the Flight Cadet obtaining the highest total marks in Mathematics and Science has been won by Flt./Cadet Corporal Shelley, T.

The Prize awarded to the Flight Cadet in the Senior Term obtaining the highest marks in Aeronautical Engineering has been awarded to Flt./Cadet Corporal Shelley, T.

The Prize awarded to the Flight Cadet in the Senior Term obtaining the highest marks in Humanistic Subjects has been awarded to Flt./Cadet Sgt. Weston, T. G. W.

AIRCRAFT APPRENTICES, HALTON

On December 18, Marshal of the Royal Air Force Sir Hugh Trenchard, made the Passing-Out Inspection of the 13th (January, 1926) entry of Aircraft Apprentices at No. 1 School of Technical Training, Halton, Bucks.

The January, 1926, Entry is the 13th to pass out into the service on completion of the course of apprenticeship training. Of the 501 boys originally enlisted as aircraft apprentices, 60 were posted to Flowerdown for training as wireless operator mechanics and electricians; 4 were granted discharge by purchase; 24 were discharged as "Unlikely to become efficient airmen"; 2 were discharged on medical grounds; 1 died; 11 have been transferred to other entries; 15 were transferred from other entries, of whom one has since been discharged, leaving 413 due to pass out from Halton.

These have been trained as follows:—Fitter aero engine, 151; fitter driver, petrol, 53; fitter armourer, 15; carpenter rigger, 181; carpenter motor body builder, 4; coppersmith and sheet metal worker, 9.

The following are extracts from the Report by the Air Officer Commanding regarding the work completed by the entry.

Administration.—While the introduction of the system of "Unit" training by Wings somewhat disorganised progress for a period, results were so beneficial that they more than made up the loss.

Drill and Discipline.—The standard achieved by previous entries has been maintained. *Technical Training* was accomplished with satisfactory results.

Fitters (Aero Engine).—This entry has had more experience in engine running and detection of faults than previous entries, owing to the completion of the new engine test house, containing two up-to-date test benches.

Carpenter Riggers.—Considerable benefit has been derived during the Aerodrome Course by the substitution of some more recent types of aircraft for the out-of-date types previously in use.

Fitters Driver (Petrol). Taken as a whole, this entry has made better progress than previous entries and the standard of driving is very markedly improved.

Coppersmith and Sheet Metal Workers.—This entry is the first to pass-out under the new trade of coppersmiths and sheet metal workers. During their period of training the syllabus has been revised and extended to bring it up to date with the latest improvements in aircraft. The syllabus was completed well within the scheduled time and apprentices were then employed on maintenance work on aircraft and M.T. whenever possible, this increasing their practical experience.

Fitters Armourer.—The standard of proficiency in fitting is of a high order and compares favourably with that of previous entries.

Carpenter Motor Body Builders.—Only four apprentices have been put through this training for the trade, and these have built one complete body for a Leyland lorry which is now in service and, in addition, have performed all the body repairs for the Station and Instructional Transport.

Physical Training and Games.—The general standard attained by this entry is high, but more playing grounds are required to allow boys of average ability to get a better chance.

Educational Training.—Of the 410 aircraft apprentices who took the Educational Examination:—37 have been placed in class "A" (75 per cent. or over), 305 have been placed in class "B" (50 per cent. or over), 68 have been placed in class "C" (under 50 per cent.).

Health.—The general health of the entry has been satisfactory and compares favourably with previous entries.

The average increase in height is 3¼ in., and the average increase in weight is 27 lb. This shows a very satisfactory standard of development.

Advanced Course for Corporals.—The following aircraft apprentices are retained for the advanced course:—560446 T. W. Turnbull, 360392 T. E. Philbrick, 560272 S. Hatswell, 560365 E. H. Maule, 560322 H. S. Moore, 560031 A. W. S. Brown, 560296 W. A. Hampshire, 560358 F. C. Newton, 560327 W. R. Cumbers, 560256 T. L. Reeves, 560071 R. N. Carpenter, 560342 C. C. Matthews, 560460 L. N. Woolacott, 560123 R. D. Griffin, 560449 N. W. Turner.

Awards.—The following is a list of awards offered by the Air Ministry:—

Grand aggregate:—560391 A./A. W. S. Reed—Fitter A.E.

Educational subjects:—560431 A./A. F. G. Tearle—Fitter Arm.

Fitter aero engine:—First—560353 A./A. R. Nelson. Second—560391 A./A. W. S. Reed.

Carpenter (rigger) and (*motor body builder*):—First—560291 A./A. T. Horner. Second—560123 A./A. R. D. Griffin.

Other trades:—First—560296 A./A. W. A. Hampshire—Fitter Arm. Second—560460 A./A. L. N. Woolacott—Copp. and M. Worker.

The Sir Charles Wakefield Scholarship has been awarded to:—560391 W. S. Reed. The results of the final examination are as follows:—38 aircraft apprentices have classified as L.A.C. 181 a rcraft apprentices have classified as A.C.1; 181 aircraft apprentices have classified as A.C.2; 5 aircraft apprentices failed; 8 aircraft apprentices were not examined or did not complete their examinations.

Cadetships.—Cadetships have been offered to:—560391 W. S. Reed, 560122 W. H. Hodgkinson, 560291 T. G. Horner, 560052 T. N. Coslett.

IN PARLIAMENT

Enlistment

Sir S. Hoare, on December 11, in reply to Mr. Hore-Belisha, said: During the period January 1 to November 30, 1928, 5,521 effective applications were received from men and boys for enlistment in the Royal Air Force. The number attested during that period was 1,615 men and 1,104 boys.

Fleet Air Arm and Parachutes

Sir Philip Sassoon, on December 12, in reply to Capt. Garro-Jones said machines of the Fleet Air Arm and other seagoing aircraft have not yet been supplied with parachutes owing to the danger of the wearer becoming entangled in his harness if the machine falls into the sea. Research and experiment with a view to the design of a satisfactory quick release gear have been proceeding continuously, and though certain difficulties remain to be solved, it is hoped these may be overcome in the early future. As regards the rest of the Royal Air Force, a parachute is now provided for every seat in every first-line machine capable of taking it. The question of quick release, in the case of land machines, was not nearly so important, because you cannot get drowned on land, and the possibility of fire was also not so important.

Sheffield Municipal Aerodrome

Sir P. Sassoon, in reply to Mr. Rennie Smith, said the Sheffield Corporation have notified the Air Ministry that they contemplate taking steps to acquire a site and to obtain a renewal of the powers conferred upon them by the Sheffield Corporation Act, 1920, in regard to the establishment of a municipal aerodrome. An officer of the Air Ministry recently visited Sheffield at the request of the Corporation, for the purpose of inspecting possible sites and discussing the question of an aerodrome with the municipal officers, and every assistance, which my Department can render will be at the disposal of the Corporation for this purpose.

London-South Africa Air Services

Sir Philip Sassoon, on December 13, replying to Sir R. Thomas as to whether any investigation had been made into the practicability of establishing an air service between London and South Africa, said that a number of flights between London and South Africa and also between intermediate points, such as Khartoum and Kisumu, have been made and valuable information has been obtained as a result. They have, for example, served to furnish data regarding landing grounds and the best route to be followed, but the actual details of the route selected will naturally depend upon whether landplanes or seaplanes are to be used over certain stages of the journey. These and other questions can only be finally determined when concrete proposals for an air service to the Cape have been formulated. I am expecting such proposals in the very early future and, if they appear prima facie practicable, immediate steps will be taken to invite the co-operation of His Majesty's Government in the Union of South Africa, who are aware of our general intention and desire to develop Imperial air communications of this nature.

West Indies Air Services

Sir H. Brittain, on December 19, asked the Secretary of State for Air whether any project has been brought before him for an American air service which would link up two or more of the West Indian Islands; and whether, before any suggestion of this kind becomes an accepted fact, an effort can be made to see that this series of British islands be joined together by a service carried out under British ownership and British management?

Sir S. Hoare: As regards the first part of the question, I am aware that arrangements have been made by an American company to establish an experimental air service between Miami, Florida, and Nassau, Bahamas, and that the eventual extension of this service to the other West Indian Islands has been proposed. As regards the second part, I am in the fullest sympathy with my hon. friend's desire that the linking up of the islands by air should be in British hands, but the matter is essentially one for commercial enterprise, with or without subsidy from the local Governments. The whole question of civil air transport in the West Indies was dealt with by the Committee mentioned in the reply given to Sir R. Thomas on December 6.

THE ROYAL AIR FORCE MEMORIAL FUND

The last meeting of the Executive Committee of the Fund for 1928 was held at Iddlesleigh House on December 12. In the absence of Lord Hugh Cecil (who was prevented by another engagement from attending), the chair was occupied by the honorary treasurer, Sir Charles McLeod, Bart. Owing, doubtless, to the approach of the holidays there was only a small attendance.

The chairman referred with great pleasure to two very large donations which had been made to the Fund by the Air Council in respect in the first place to some portion of the R.A.F. share of the profits of the Royal Tournament at Olympia in June, 1928, and in the second place to a donation out of the profits arising from the R.A.F. Display held at Hendon in July last, and which was the most successful display on record. A resolution of thanks was approved, which the chairman, Lord Hugh Cecil, was requested to convey to the Air Ministry.

The Committee heard with much regret an offer from Lord Hugh Cecil, who has been chairman of the Fund since its inception in 1919, to resign the chair, but to retain membership of the Committee, this being due to a great pressure of other work. This matter, however, was deferred for further consideration until the next meeting of the Committee, Lord Hugh Cecil in the meantime retaining the chair.

It was reported to the meeting that, as has been customary for the past five years, a wreath provided by the fund was laid at the foot of the R.A.F. War Memorial on the Victoria Embankment on Armistice Sunday by Marshal of the Royal Air Force, Sir Hugh Trenchard, Bart., G.C.B., Chief of the Air Staff, on behalf of the Royal Air Force and of the Executive Committee of this Fund.

Mention was also made at the meeting that a similar wreath had been provided by the Fund and had been laid at the "Stone of Remembrance" opposite St. Giles' Cathedral, Edinburgh, on Armistice Sunday, this being a joint ceremony with the Royal Navy and the Army.

The Committee gave consideration to a question as to the advisability of changing the date of the ceremony at the War Memorial on the Victoria Embankment, which has always hitherto been held within half an hour of the National ceremony at the Cenotaph, a suggestion being made by Marshal of the Royal Air Force, Sir Hugh Trenchard, that the Committee might consider having this ceremony on some day other than Armistice Day ceremony which is held in respect to all the services, and the nation on Armistice Day.

The Committee, after considering this question, came to the opinion that it was advisable to change the date in view of Sir Hugh Trenchard's recommendation and the circumstances generally, and unanimously agreed that the ceremony at the R.A.F. War Memorial, London, should take place on the Sunday previous to Armistice Day in each year, and it is hoped this suggestion will be agreeable to everyone concerned.

The secretary was directed as usual to prepare an Annual Report for the current year. The Committee agreed to the undermentioned dates being fixed tentatively for meetings of the Executive Committee during the ensuing year, all meetings to be held at 3 p.m. (Wednesdays), March 13, April 24, June 26, October 9, December 11, 1929.

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Aeronautical Research Committee Reports and Memoranda: No. 1151 (*Ae.* 317).—The Characteristics of a Karman Vortex Street in a Channel of Finite Breadth. By H. Glauert. Dec., 1927. Price 9*d.* net. H.M. Stationery Office, Kingsway, London, W.C.2.

Journal of the Royal Aeronautical Society, Vol. XXXII. No. 215. *November*, 1928. The Royal Aeronautical Society, with which is Incorporated the Institution of Aeronautical Engineers, 7, Albemarle Street, London, W.1. Price 3*s.* 6*d.*

Alkaline Accumulators. By J. T. Crennell, B.A., and F. M. Lea, M.Sc. Longmans Green and Co., Ltd., 39, Paternoster Row, London, E.C. Price 10*s.* 6*d.* net.

The Golden Book. Roll of Honour of the Canadian Military Institute, Toronto, Canada.

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Tour pour l'Aviation. Marabini-Aviation, 9, Avenue de Suffren, Paris.

Guests of the Unspeakable. By T. W. White. John Hamilton, Ltd., 90, Newman Street, London, W.1. Price 12*s.* 6*d.* net.

Pocket Almanac of Aeronautics. 1928–29. Edited by Dr. Ing. Werner von Langsdorff. H. Bechhold Verlag, Niddastrasse 81–83, Frankfurt-M., Germany. Price Rm. 12.

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AERONAUTICAL PATENT SPECIFICATIONS

(*Abbreviations:* Cyl. = cylinder; i.c. = internal combustion; m. = motor. The numbers in brackets are those under which the Specifications will be printed and abridged, etc.)

APPLIED FOR IN 1927

Published December 27, 1928.

22,711. V. Isacco. Flying machine. (276,997.)
31,680. F. H. Orbidge and D. L. H. Williams. Landing-gear for aircraft. (301,639.)

APPLIED FOR IN 1928

Published December 27, 1928

12,609. M. Birkigt. Engines comprising a plurality of cylinders having a common jacket. (299,030.)
12,610. M. Birkigt. Engines, including a plurality of cylinders contained in the same jacket. (301,698.)
13,657. Bendix Brake Co. Control of aircraft. (290,209.)

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